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RESOURCE CONSERVATION AND RECOVERY ACT FACILITY ASSESSMENT SAMPLING VISIT WORK PLAN FOR GROUP 3 SOLID WASTE MANAGEMENT UNITS 20, 21, 29, 46 AND 52 NS MAYPORT FL

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RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) FACILITY ASSESSMENT SAMPLING VISIT WORKPLAN

GROUP III
SOLID WASTE MANAGEMENT UNITS 20, 21, 29, 46, AND 52

U.S. NAVAL STATION MAYPORT
MAYPORT, FLORIDA

Unit Identification Code (UIC) No. N60201

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FOREWORD

To meet its mission objectives, the U.S. Navy performs a variety of operations, some requiring the use, handling, storage, or disposal of hazardous materials. Through accidental spills and leaks and conventional methods of past disposal, hazardous materials may have entered the environment in ways unacceptable by today's standards. With growing knowledge of the long-term effects of hazardous materials on the environment, the Department of Defense (DOD) initiated various programs to investigate and remediate conditions related to suspected past releases of hazardous materials at their facilities.

One of these programs is the Installation Restoration (IR) program. This program complies with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA). The acts, passed by Congress in 1980 and 1986, respectively, established the means to assess and cleanup hazardous waste sites for both private-sector and Federal facilities. These acts are the basis for what is commonly known as the Superfund program.

Originally, the Navy's part of this program was called the Navy Assessment and Control of Installation Pollutants (NACIP) program. Early reports reflect the NACIP process and terminology. The Navy eventually adapted the program structure and terminology of the IR program.

The IR program is conducted in the following stages.

- The Preliminary Assessment (PA) identifies potential sites through record searches and interviews.
- A Site Inspection (SI) then confirms which areas contain contamination, constituting actual "sites." (Together, the PA and SI steps were called the Initial Assessment Study [IAS] under the NACIP program.)
- Next, the Remedial Investigation and the Feasibility Study (RI/FS) together determine the type and extent of contamination, establish criteria for cleanup, and identify and evaluate any necessary

remedial action alternatives and their costs. As part of the RI/FS, a Risk Assessment identifies potential effects on human health or the environment to help evaluate remedial action alternatives.

- The selected alternative is planned and conducted in the Remedial Design and Remedial Action Stages. Monitoring then ensures the effectiveness of the effort.

A second program to address present hazardous material management is the Resource Conservation and Recovery Act (RCRA) Corrective Action Program. This program is designed to identify and cleanup releases of hazardous substances at RCRA-permitted facilities. RCRA is the law that ensures solid and hazardous wastes are managed in an environmentally sound manner. The law applies primarily to facilities that generate or handle hazardous waste.

This program is conducted in three stages.

- The RCRA Facility Assessment (RFA) (confirmatory sampling) identifies solid waste management units (SWMUs), evaluates the potential for releases of contaminants, and determines the need for future investigations.

- The RCRA Facility Investigation (RFI) then determines the nature, extent, and fate of contaminant releases.

- The Corrective Measures Study (CMS) identifies and recommends measures to correct the release.

The hazardous waste investigations at Naval Station Mayport are presently being conducted under the RCRA Corrective Action Program. Earlier preliminary investigations had been conducted at Naval Station Mayport under the NACIP program and IR program following Superfund guidelines. In 1988, in coordination with the U.S. Environmental Protection Agency (USEPA) Region IV and the Florida Department of Environmental Regulation (FDER) (now the Florida Department of Environmental Protection [FDEP]), the hazardous waste investigations were formalized under the RCRA program.

Mayport is conducting the cleanup at their facility by working through the Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM). The USEPA and the FDEP oversee the Navy environmental program. All aspects of the program are conducted in compliance with State and Federal regulations, as ensured by the participation of these regulatory agencies.

Questions regarding the RCRA program at Naval Station Mayport should be addressed to Mr. David Driggers, Code 1852, at (803) 743-0501.

EXECUTIVE SUMMARY

This Resource Conservation and Recovery Act (RCRA) Facility Assessment Sampling Visit (RFA/SV) workplan (confirmatory sampling) is prepared to address the sampling activities at the Group III Solid Waste Management Units (SWMUs) 20, 21, 29, 46, and 52 in accordance with the RCRA Corrective Action Program at U.S. Naval Station Mayport as described in the Corrective Action Management Plan (CAMP). The CAMP is located in Appendix F of Volume I of the RCRA Facility Investigation (RFI) Workplan (ABB Environmental Services, Inc., 1991). An interim final CAMP was submitted for regulatory approval in May 1994. The Group III SWMUs requiring confirmatory sampling addressed in this RFA/SV workplan are listed below:

SWMU 20, Hobby Shop Drain;

SWMU 21, Hobby Shop Scrap Storage Area;

SWMU 29, Oily Waste Pipeline Break (Navy Installation Restoration Program [NIRP] Site 12);

SWMU 46, Shore Intermediate Maintenance Activity (SIMA) Engine Drain Sump; and

SWMU 52, Public Works Department (PWD) Service Station Storage Area.

The purpose of RFA/SV sampling activities is to confirm whether or not contaminant releases have occurred. Releases of contaminants to the environmental are suspected but not confirmed at SWMUs 20, 21, and 56. Releases of petroleum-related contaminants have been confirmed at SWMUs 29 and 46. No RFA/SV sampling activities are proposed for SWMUs 29 and 46 because they are being assessed under Chapter 62-770, Florida Administrative Code (FAC) (*State Underground Petroleum Environmental Response*) regulations on petroleum contamination, and the Florida Department of Environmental Protection is providing oversight. However, brief descriptions of these SWMUs are included in this RFA/SV workplan because both are listed in the Hazardous and Solid Waste Amendments (HSWA) permit as requiring RFA/SVs.

Group III SWMUs requiring confirmatory sampling that are not addressed in this RFA/SV Workplan are as follows:

SWMU 18, Fleet Training Center (FTC) Diesel Generator Sump;
SWMU 23, Jacksonville Shipyard, Inc. (JSI), Area;
SWMU 24, North Florida Shipyard, Inc. (NFSI), Area;
SWMU 25, Atlantic Marine, Inc. (AMI), Area;
SWMU 44, Wastewater Clarifiers 1 and 2; and
SWMU 45, Wastewater Treatment Facility Sludge Drying Beds.

The SWMUs not addressed here are being assessed with and included in the Group III RFI Workplan. SWMU 18 is located in the proximity of RFI SWMU 14, Mercury/Oil Waste Spill Area, and shares a similar hydrogeologic setting and similar petroleum related contamination. SWMUs 23, 24, 25, 44, and 45 are in the proximity of SWMU 1, Landfill A, share a similar hydrogeologic setting, and may have some similar contaminants.

This RFA/SV workplan proposes locations to collect environmental samples from suspected affected media (sediment, surface water, soil, groundwater, and sludge) and analytical methods to confirm releases of contaminants to the environment. The analytical methods will address selected contaminants listed in the 40 Code of Federal Regulations, Part 264, Appendix IX, groundwater monitoring list. Analytical methods will include U.S. Environmental Protection Agency Method 8240 for volatile organic compounds, Method 8270 for semivolatile organic compounds, Method 8080 for chlorinated pesticides and polychlorinated biphenyls, and Methods 6010, 7420, and 7470 for metals.

Quality control and quality assurance, project organization, and health and safety protocols will follow the specifications described in the approved RFI workplan, as appropriate.

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GLOSSARY

ABB-ES	ABB Environmental Services, Inc.
ADD	Average Daily Dose
AMI	Atlantic Marine, Inc.
AOC	Area of Concern
ARARs	applicable or relevant and appropriate requirements
ASTM	American Society for Testing and Materials
ATSDR	Agency for Toxic Substances and Disease Registry
bls	below land surface
CAMP	Corrective Action Management Plan
CAR	Contamination Assessment Report
CARA	Contamination Assessment Report Addendum
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CMS	Corrective Measures Study
CPCs	contaminants of Potential Concern
CVAA	cold vapor atomic adsorption
DFM	diesel fuel, marine
DOD	Department of Defense
DQOs	data quality objectives
DRF	Discharge Reporting Form
DRMO	Defense Reutilization and Marketing Office
ESE	Environmental Science and Engineering, Inc.
ESI	Expanded Site Investigation
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FDER	Florida Department of Environmental Regulation
FTC	Fleet Training Center
GC/MS	gas chromatography and mass spectroscopy
GFAA	graphite furnace atomic adsorption
HASP	Health and Safety Plan
HEAST	Health Effects Assessment Summary Tables
HI	Hazard Index
HQ	Hazard Quotient
HSA	hollow-stem augers
HSO	Health and Safety Officer
HSWA	Hazardous and Solid Waste Amendments
IAS	Initial Assessment Study
ICP	inductively coupled plasma
IR	Installation Restoration
IRIS	Integrated Risk Information System
JSI	Jacksonville Shipyard, Inc.

GLOSSARY (Continued)

LADD	Lifetime Average Daily Dose
mg/kg	milligrams per kilogram
MPT	Mayport
$\mu g/\ell$	micrograms per liter
NACIP	Navy Assessment and Control of Installation Pollutants
NADEP	Naval Aviation Depot
NAVSTA	Naval Station
NFA	no further action
NFSI	North Florida Shipyard, Inc.
NIRP	Navy Installation Restoration Program
NTU	nephelometric turbidity units
OVA	organic vapor analyzer
PA	Preliminary Assessment
PCBs	polychlorinated biphenyls
PEL	permissible exposure limit
ppm	parts per million
PWD	Public Works Department
QA	quality assurance
QAP	Quality Assurance Plan
QAPP	Quality Assurance Project Plan
QC	quality control
RAP	Remedial Action Plan
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFA/SV	RCRA Facility Assessment Sampling Visits
RfDs	reference doses
RFI	RCRA Facility Investigation
RI/FS	Remedial Investigation and Feasibility Study
SARA	Superfund Amendments and Reauthorization Act
SCs	screening concentrations
SI	Site Inspection
SIMA	Shore Intermediate Maintenance Activity
SOUTHNAV-FACENGCOM	Southern Division, Naval Facilities Engineering Command
SMP	Site Management Plan
SVOCs	semivolatile organic compounds
SWMU	Solid Waste Management Unit
THI	Total Hazard Index
TICs	tentatively identified compounds
TLV	threshold limit value
TM	Technical Memoranda

GLOSSARY (Continued)

UCL	upper confidence limit
UIC	Unit Identification Code
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
VOA	Volatile Organic Analyte
VOCs	volatile organic compounds
VSI	visual site inspection

1.0 INTRODUCTION

This workplan presents the background, approach, and data-gathering procedures for Resource Conservation and Recovery Act (RCRA) investigations of selected Solid Waste Management Units (SWMUs) at U.S. Naval Station (NAVSTA) Mayport. NAVSTA Mayport is located in northeastern Duval County, Florida, at the confluence of the St. Johns River and the Atlantic Ocean, as shown on Figure 1-1.

1.1 RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) CORRECTIVE ACTION PROGRAM. Hazardous and Solid Waste Amendments (HSWA) permit No. FL9-170-024-260 was issued to NAVSTA Mayport on March 25, 1988, and revised and renewed on June 15, 1993. The permit requires assessment and corrective action (if necessary) at past hazardous waste disposal units. An RCRA Facility Assessment (RFA), including a visual site inspection (VSI), for NAVSTA Mayport was conducted on behalf of the U.S. Environmental Protection Agency (USEPA) Region IV by their contractor, A.T. Kearney, Inc., in 1989.

The RFA identified 56 SWMUs and 2 Areas of Concern (AOC) at NAVSTA Mayport. The two AOCs consist of petroleum underground storage tanks and appurtenances and are being managed under a different program of RCRA (e.g., 40 Code of Federal Regulations [CFR] 280, Subtitle I, *Regulation of Underground Storage Tanks*). Fifteen of the SWMUs were determined to require no further action because no release of hazardous substances to the environment had occurred. Twenty-three of the remaining SWMUs were determined to require further investigation in the form of confirmatory sampling because hazardous substance releases to the environment were suspected but not confirmed. Comfirmatory sampling in the form of RFA Sampling Visits (RFA/SV) were recommended for these 23 sites to confirm the presence or absence of releases to the environment. The remaining 18 SWMUs were determined to require an RCRA Facility Investigation (RFI) because hazardous substance releases to the environment were confirmed and required further characterization to determine the nature and extent of contamination.

Due to the number of SWMUs at NAVSTA Mayport, the diversity of their past and/or present operations, and the magnitude of permit requirements, the USEPA recommended that a phased approach be used to implement an RFI and other corrective action activities. A Corrective Action Management Plan (CAMP) was prepared that describes the phased approach, proposed schedule, and strategy to implement the RCRA Corrective Action Program at NAVSTA Mayport. The initial CAMP is located in Appendix F of Volume I of the USEPA-approved RFI workplan (ABB Environmental Services, Inc. [ABB-ES], 1991). A revised interim final CAMP was submitted for regulatory approval in May 1994. The CAMP identifies the operational groups of SWMUs, ranks them by their relative risks to human health and the environment, and contains the proposed schedule for the phased site assessment, field investigations, and report submittals.

The purpose of the NAVSTA Mayport CAMP is to outline the strategy for conducting assessments to confirm and characterize the nature and extent of suspected releases of hazardous substances to the environment at NAVSTA Mayport. The assessments consist of RFIs to characterize the nature and extent of confirmed contamination and RFA/SVs to confirm the presence of suspected contamination in accordance with the requirements of the HSWA permit.

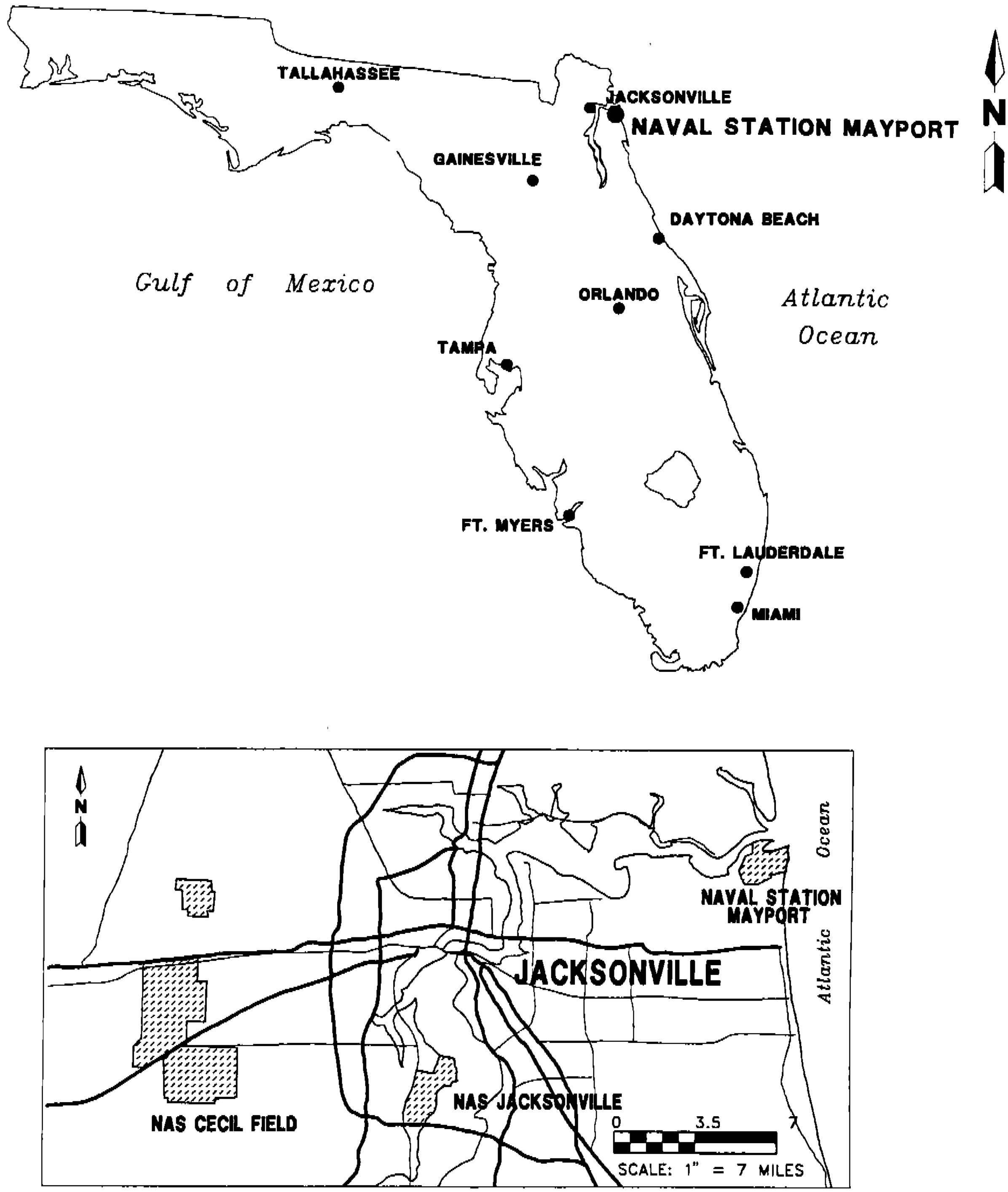

FIGURE 1-1
FACILITY LOCATION MAP

RCRA FACILITY ASSESSMENT
GROUP III SWMUs

U.S. NAVAL STATION
MAYPORT, FLORIDA

MAYPORT/MAYLOCAT/KGP-WDW/11-15-94-

To achieve this goal, four SWMU groups were defined in the NAVSTA Mayport RCRA CAMP (Figure 1-2). SWMU Groups I through III were defined by clustering individual SWMUs within a geographic area, and by commonality of past waste management practices and corrective measures. SWMUs in Group IV are not within a single geographic area, but are utility networks and systems that span multiple geographic areas.

The Group III SWMUs are located in the eastern part of NAVSTA Mayport contiguous with the Turning Basin, the Atlantic Ocean, and the mouth of the St. Johns River and include former hazardous and solid waste storage areas, fire-fighting training areas, and wastewater treatment facilities (Figure 1-2). The SWMUs were incorporated into Group III because of their: (1) proximity to each other, (2) nearness to the Mayport Turning Basin and Atlantic Ocean, and (3) potential for similar or related corrective measures. Group III SWMUs were ranked as Priority 3 because of a "low perceived risk" due to contaminants being of localized areal extent and affecting a small volume of soil and groundwater, and a potential for minimal, if any, adverse impacts to ecological receptors by soil and groundwater. Group III includes SWMUs 1, 14, 17, 18, 20, 21, 23, 24, 25, 29, 44, 45, 46, and 52.

The Group III SWMUs that require an RFI are SWMUs 1, 14, and 17 (USEPA, 1988; A.T. Kearney, Inc., 1989). RFI assessment activities are being proposed in a separate RFI workplan addendum for Group III SWMUs. Proposed RFA/SV (Confirmatory Sampling) assessment activities are included in this workplan.

Although the HSWA permit identified the following Group III SWMUs as requiring confirmatory sampling (Figure 1-2), they are being assessed with and included in the Group III RFI workplan.

- SWMU 18, Fleet Training Center (FTC) Diesel Generator Sump;
- SWMU 23, Jacksonville Shipyard, Inc. (JSI), Area;
- SWMU 24, North Florida Shipyard, Inc. (NFSI), Area;
- SWMU 25, Atlantic Marine, Inc. (AMI), Area;
- SWMU 44, Wastewater Clarifiers 1 and 2; and
- SWMU 45, Wastewater Treatment Facility Sludge Drying Beds.

SWMU 18 is located in the proximity of RFI SWMU 14, Mercury/Oil Waste Spill Area, and they share a similar hydrogeologic setting and similar petroleum related contamination. SWMUs 23, 24, 25, 44, and 45 are in the proximity of SWMU 1, Landfill A, and share a similar hydrogeologic setting and may have some similar contaminants.

SWMUs 20, 21, 29, 46, and 52 are discussed in this RFA/SV workplan.

Previous investigations under the RCRA Corrective Action Program at NAVSTA Mayport include RFI and RFA/SV activities at Groups I and II SWMUs (Figure 1-2). Currently, proposed activities under the RCRA Corrective Action Program address the SWMUs located in the Group III SWMU area and include field investigative activities for both the RFI site characterizations and RFA/SVs. Group IV SWMU area sites will be addressed in subsequent investigations in accordance with the CAMP.

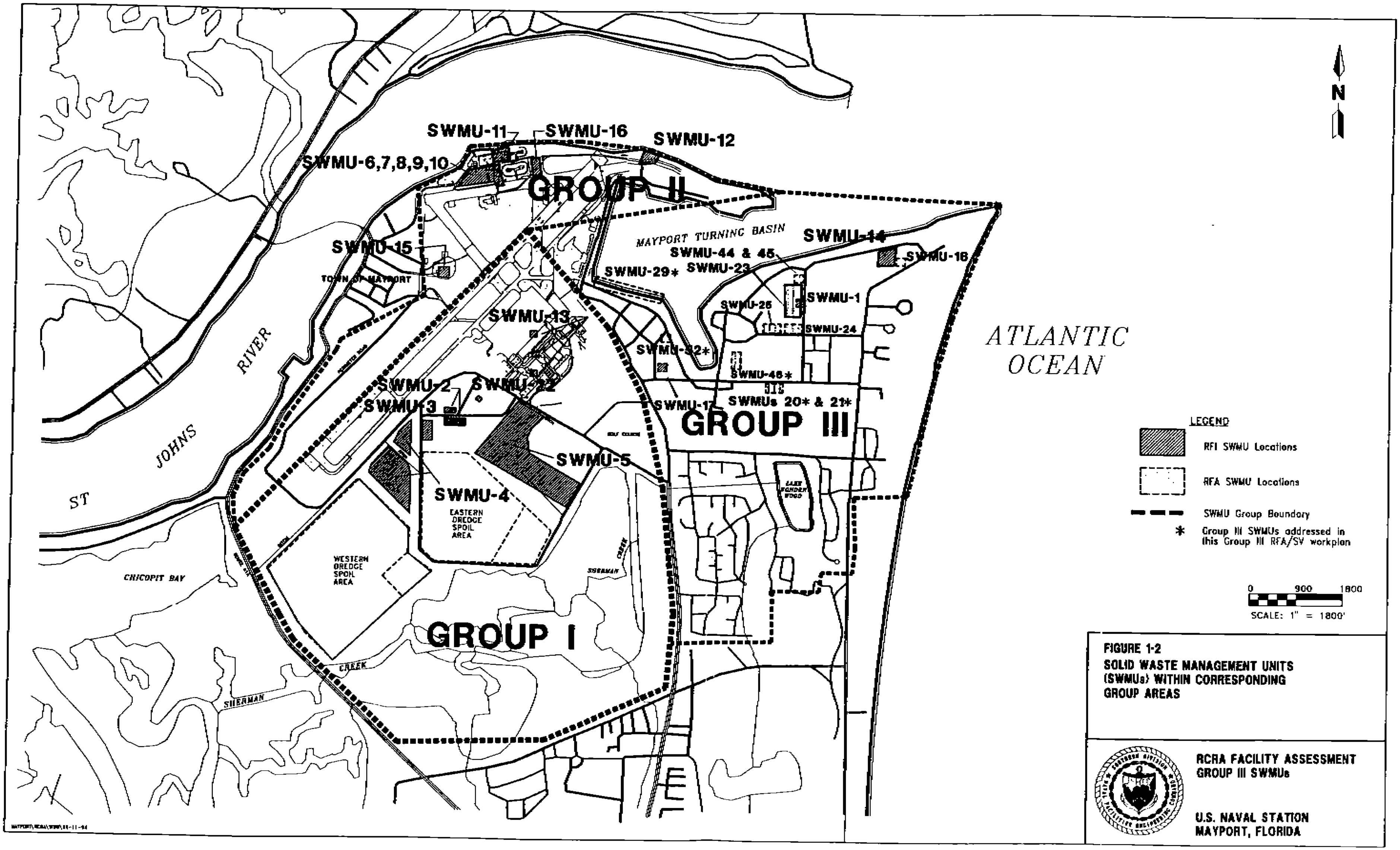

FIGURE 1-2
SOLID WASTE MANAGEMENT UNITS (SWMUs) WITHIN CORRESPONDING GROUP AREAS

RCRA FACILITY ASSESSMENT
GROUP III SWMUs

U.S. NAVAL STATION
MAYPORT, FLORIDA

An RFI workplan (ABB-ES, 1991), which addresses all SWMUs requiring an RFI, was prepared by the Navy, and reviewed and approved by the USEPA (USEPA, 1991). The RFI workplan presents the following information for all the SWMUs at NAVSTA Mayport that require an RFI:

1. background information for both NAVSTA Mayport as a whole and the individual SWMUs addressed by the HSWA permit,

2. a summary of previous investigative data,

3. a presentation of the rationale used to define the present RFI investigative strategy,

4. data gathering procedures contained in the Sampling and Analysis Plan,

5. the quality assurance and quality control (QA/QC) standards and protocols contained in the Quality Assurance Project Plan (QAPP), and

6. the Health and Safety Plan (HASP).

__1.2 GROUP III INVESTIGATIONS__. This RFA/SV workplan addresses the Group III RFA/SV SWMUs (Figure 1-2) listed below:

- SWMU 20, Hobby Shop Drain;
- SWMU 21, Hobby Shop Scrap Storage Area;
- SWMU 29, Oily Waste Pipeline Break (Navy Installation Restoration Program [NIRP] Site 12);
- SWMU 46, Shore Intermediate Maintenance Activity (SIMA) Engine Drain Sump; and
- SWMU 52, Public Works Department (PWD) Service Station Storage Area.

The purpose of RFA/SV sampling activities is to confirm whether or not contaminant releases have occurred. Releases of contaminants to the environment are suspected but not confirmed at SWMUs 20, 21, and 56. Releases of petroleum-related contaminants have been confirmed at SWMUs 29 and 46. No RFA/SV sampling activities are proposed for SWMUs 29 and 46 because they are being assessed under Chapter 62-770, Florida Administrative Code (FAC) (*State Underground Petroleum Environmental Response*) regulations on petroleum contamination, and the FDEP is providing oversight. However, brief descriptions of these SWMUs are included in this RFA/SV workplan because both are listed in the HSWA permit as requiring RFA/SVs

This RFA/SV workplan is intended to serve as a supplemental document to the RFI Workplan and is consistent with the approved QAPP and HASP. Applicable sections of the RFI workplan have been referenced in this RFA/SV workplan where appropriate. The RFA/SV sampling activities will include the collection of soil and groundwater samples from SWMUs 20, 21, and 52.

Analytical results of environmental samples will be used to assess whether contaminants are present or potentially have been released from SWMUs 20, 21, and 52. The analytical data also will be used to conduct a preliminary risk screening of SWMUs 20, 21, and 52. The preliminary risk screening will include numeric estimates of excess cancer and non-cancer risks for present use and residential use. Given the limitations of the number of samples and analytical data, only a qualitative evaluation of uncertainty will be feasible. Based on comparison of the analytical data to relevant regulatory criteria and results of the preliminary risk screening, recommendations will be made for additional sampling or conducting an RFI, if necessary, or no further action at this time.

2.0 BACKGROUND

The following sections summarize the known background data for each Group III RFA/SV SWMU and include site characteristics, past activities, and suspected contaminant release scenarios (e.g., types of contaminants, quantities, and affected media). Most of this information is obtained from a VSI conducted during the RFA by A.T. Kearney, Inc., in 1989 and an Initial Assessment Study (IAS) conducted by Environmental Science and Engineering, Inc. (ESE), in 1986.

2.1 SOLID WASTE MANAGEMENT UNIT (SWMU) 20, HOBBY SHOP DRAIN. The Hobby Shop is located in and around Building 414 in the southeastern part of Mayport (Figure 2-1). A.T. Kearney, Inc., conducted an RFA for the site in 1989; however, since the VSI in 1991, renovations were made to parts of the Hobby Shop area.

According to the RFA in 1989, the Hobby Shop Drain (SWMU 20) was located at the southeast corner of Building 1277 (currently Building 1277A, Figure 2-1), which also housed automotive maintenance and repair bays. The drain was located on the soil adjacent to a sloped concrete apron leading to the raised concrete floor of Building 1277. The drain inlet was covered with a screen and led to an underground pipe. The outlet for the pipe was reported to be at grade in the western side of Building 1277 at the edge of an asphalt parking lot. The Hobby Shop had been reported to be in operation since 1959 (A.T. Kearney, Inc., 1989). A map depicting the features and conditions observed during the VSI were not provided in the 1989 RFA report.

At the time of the VSI in 1989, the soil in the area of the drain inlet and along the edge of the concrete apron was stained and appeared oily. Stains were also noted leading from the outlet of the drain pipe, across the parking lot, and toward a storm drainage ditch that parallels Massey Avenue on the south side of the roadway. Because of the staining, the drainage pathway across the asphalt was clearly visible and was observed to be cracked with some repaired sections along its length. Dark oily sediments were observed in the drainage ditch and an oily sheen was also noted at the point where the water in the drainage ditch entered a drain pipe that flowed under a side street perpendicular to Massey Avenue (A.T. Kearney, Inc., 1989).

The source of the dark staining and oil was not identified at the time of the VSI (A.T. Kearney, Inc., 1989). Possible sources indicated were material drained from inside the automobile maintenance and repair bays, or runoff from the roadway and parking area to the east of Building 1277 (A.T. Kearney, Inc., 1989). Building 414 is east of Building 1277.

Further investigation was recommended for SWMU 20 in the RFA because of highly permeable soil, the evidence of releases of an oily substance to soil and surface water, and the types of materials typically generated in automotive maintenance and repair activities. In the 1989 RFA report, it was suggested that the number and location of samples should be sufficient to identify the extent and characterize releases to the environment based on the following criteria: identify the source of the influent to the drain, collect soil samples in the area of the drain and source area, collect soil samples from beneath the asphalt along the drainage pathway across the parking lot on the west side of Building 1277, and collect sediment and surface water samples from the storm ditch into

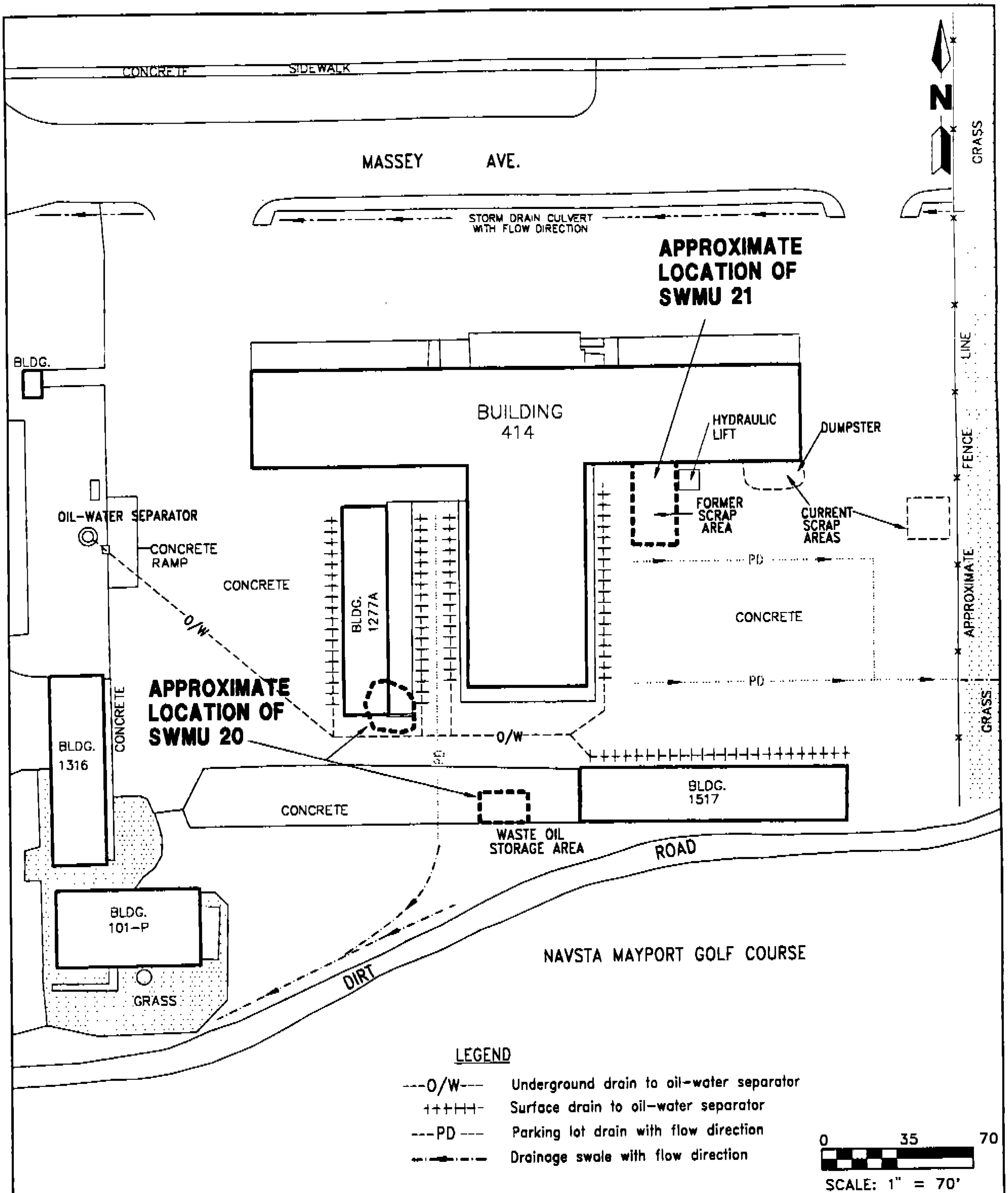

FIGURE 2-1
SWMUs 20 AND 21 SITE MAP

RCRA FACILITY ASSESSMENT
GROUP III SWMUs

U.S. NAVAL STATION
MAYPORT, FLORIDA

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which the effluent from the drain is believed to have discharged. Also, it was suggested that samples should be analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), and metals.

During a site visit by ABB-ES on May 5, 1994, the conditions described in the 1989 RFA were not observed. In 1991, the Hobby Shop area was renovated. This renovation included construction of a new Building 1277 (1277A) as well as a new drain system and new concrete pavement across the entire site (Figure 2-1). According to anecdotal evidence from personnel in NAVSTA Mayport PWD, during the construction work, soil was excavated and removed from the site. However, documentation of the soil excavation and removal is not available.

The new drain system is comprised of long trough drains that run parallel to the garage bay doors of each building to catch runoff from the garage bays, and another separate long trough drain in the open parking lot area catches general parking lot runoff. The drains along the garage bays flow to an oil-water separator located beneath a grassy area to the west of the Hobby Shop site. The oil is periodically collected for recycling and effluent from the oil-water separator flows into the sanitary sewer system. The trough drains (storm drains) in the open parking lot flow into small grassy swales on the south and east sides of the Hobby Shop site.

Near the south discharge point (parking lot drain) is a small waste oil storage area. This is a curbed containment area on concrete pavement with waste oil containers (capacity unknown) on stands. A valved drainpipe extends through the curb towards the grassy area to the south, apparently to release rainwater buildup within the curbed containment areas. Soil adjacent to the waste oil storage area was not stained. Photographs depicting the current site conditions are presented in Appendix A.

<u>2.2 SWMU 21, HOBBY SHOP SCRAP STORAGE AREA</u>. The RFA describes the Hobby Shop Scrap Storage Area (SWMU 21) in 1989 as a fenced area, approximately 20 feet square, located adjacent to the southern wall of the east wing of Building 414, approximately 20 feet from the southeastern corner of the wing (Figure 2-1) (A.T. Kearney, Inc., 1989). The area was enclosed by the wall of Building 414 and by a chain link fence, except for an entrance way on the south side of the area. The surrounding parking lot area was old, pitted asphalt and there were no berms or curbs. Scrap metal, engine parts, and appliances were stored in the area. The scrap stored in the area was collected by the Defense Reutilization and Marketing Office for resale. Facility personnel were not able to provide the start-up date of the storage area but the Hobby Shop had been reported to be in operation since 1959 (A.T. Kearney, Inc., 1989). A map depicting the features and conditions observed during the VSI were not provided in the RFA report.

At the time of the VSI in 1989, automotive parts and repair materials were stored in the Hobby Shop area and included engine parts (including items such as engine blocks, rocker arms, and mufflers), two open gas cylinders, a 50-pound container labeled Freon 22, an automobile battery, refrigerator, and other scrap metal items (A.T. Kearney, Inc., 1989). Several of the engine parts were observed to be oily with oil dripping onto the base of the storage area. The base of the storage area was observed to be heavily stained with dark oily materials (A.T. Kearney, Inc., 1989).

Further investigation appeared warranted for SWMU 21 because of highly permeable soil in the area, the poor condition of the asphalt base of the storage area, and the evidence of releases of oily materials documented during the VSI. The RFA report suggested that to determine the characteristics and extent of releases of hazardous constituents the following should be conducted: the integrity of the asphalt base should be evaluated and if the structural integrity is determined to have been impaired, then soil samples should be collected beneath the base course material. Also, it was suggested that soil and sediment samples be collected around the perimeter of the Hobby Shop area in locations of likely runoff and drainage from the storage area and that the samples be analyzed for VOCs, SVOCs, and metals.

During a site visit by ABB-ES on May 5, 1994, the items described in the 1989 RFA were not observed. As stated previously, the Hobby Shop area was renovated in 1991. This renovation included construction of a new drain system and new concrete pavement across the entire site. Reportedly, during the construction work soil was excavated and removed from the site. However, documentation of the soil excavation and removal is not available.

Currently, the scrap area is located farther towards the east from the southeast corner of Building 414 near the eastern edge of the Hobby Shop site. The scrap is stored on the new concrete pavement. Oily parts similar to those described in the 1989 RFA were not observed. Photographs depicting the current site conditions are presented in Appendix A.

2.3 SWMU 29, OILY WASTE PIPELINE BREAK. According to the RFA, the Oily Waste Pipeline Break (SWMU 29) occurred in 1985 at the intersection of Alpha and Bravo piers near Building 38 (A.T. Kearney, Inc., 1989). A map depicting the location of this SWMU was not provided in the RFA report. An investigation conducted in response to reports that oil was seeping into Mayport Basin suggested that an Oily Waste Collection System (SWMU 47) pipeline valve was leaking. The area was excavated, all of the observed oil-stained soil was removed, and the valve was repaired. The amount of oily waste that leaked from the pipeline was reported to be not known (A.T. Kearney, Inc., 1989).

The Oily Waste Pipeline Break was identified as NIRP Site 12 in the IAS. No further investigation was recommended in the IAS because it was believed that the quantities of oil remaining in the soil would be small (A.T. Kearney, Inc., 1989). The Oily Waste Pipeline Break was not identified as an SWMU requiring an RFI in the HSWA permit. Based on the potential that residuals may remain in the soil, soil sampling was suggested to verify adequacy of cleanup measures (A.T. Kearney, Inc., 1989). Integrity testing and sampling in any areas of impaired integrity were also suggested for the entire Oily Waste Collection System (SWMU 47) (A.T. Kearney, Inc., 1989).

It is believed that the 1989 RFA incorrectly reported the location of the Oily Waste Pipeline Break. In 1985, product loss was discovered in a diesel fuel, marine (DFM) line at the junction of Alpha and Delta piers (Figure 2-2). Anecdotal evidence suggests that in a verbal notification made to the Florida Department of Environmental Regulation (FDER) (now known as Florida Department of Environmental Protection [FDEP]) it was estimated that more than 500 gallons of DFM were released. In a Discharge Reporting Form (DRF) submitted by NAVSTA Mayport PWD in October 1989, the date of discovery was listed as 1985 and it was

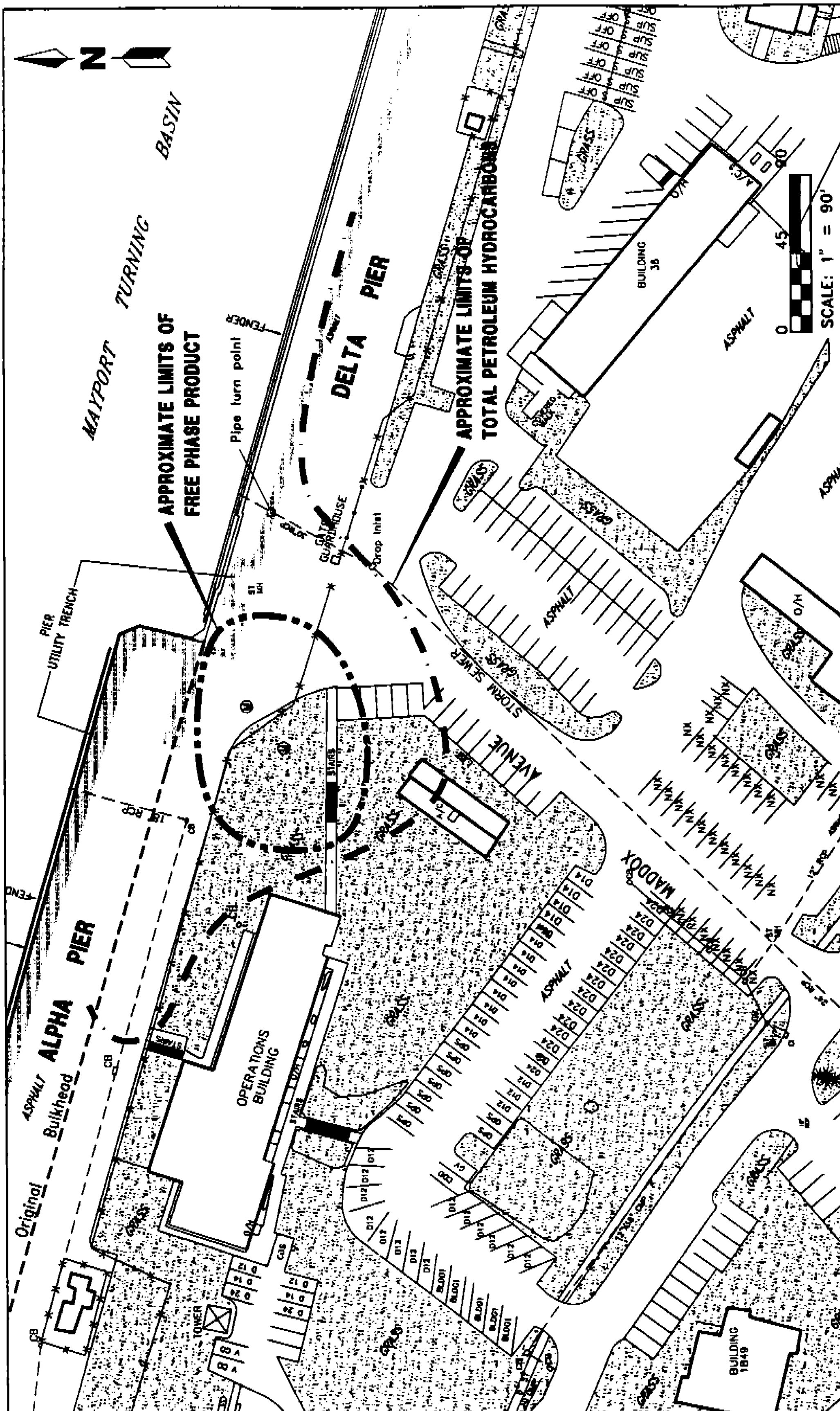

FIGURE 2-2
ALPHA DELTA PIERS,
APPROXIMATE LOCATION OF SWMU 29

See Appendix B for a description of the area studied and results.

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indicated that an unknown quantity of DFM was released. The break in the DFM line was repaired and an unknown quantity of product was recovered after the repairs were completed.

In addition to the 1985 release, in August 1988, 3½-inches of free-phase product was discovered in a utility manhole located at Alpha Pier to the south of the 1985 DFM break. Approximately 1,000 gallons of an oil-water mixture were recovered. This pipeline break was reported by the NAVSTA Mayport PWD to FDER in October 1989.

Another release is also documented in January 1990 when a DFM pipeline was cut during excavation operations at the west end of Alpha Pier. In a written report dated January 1990, it was estimated that less than 1,000 gallons of DFM were released. During the repair operations, an unknown quantity of contaminated soil was removed from the site and transported to a permitted incineration facility.

The January 1990 report also noted the discovery of old oily waste product in the excavation area, indicating a previous product release. As a result of this discovery, fitness testing was conducted on the oily waste and fuel pipelines. Because the oily waste pipeline is a gravity system, a dye test was conducted and revealed that the oily waste line was leaking and that the storm drain lines were receiving petroleum product from the lines or contaminated soil or groundwater. The testing of the DFM pipeline system for this incident and subsequent regular pressure testing suggest that no apparent leaks are present.

No RFA/SV sampling activities are proposed for SWMU 29, because SWMU 29 is being assessed under Chapter 62-770, FAC (*State Underground Petroleum Environmental Response*) regulations on petroleum contamination, and the FDEP is providing oversight. The State of Florida underground storage tank regulations are similar to or more stringent than the Federal underground storage tank regulations found in the CFR, Title 40, Part 280, *Technical Standards and Corrective Action Requirements for Owner Operators of Underground Storage Tank Programs*, which was revised and published on September 23, 1988, and became effective December 22, 1988.

Reports for SWMU 29 submitted to FDEP include a Contamination Assessment Report (CAR), a CAR Addendum (CARA), and a Remedial Action Plan (RAP). The CAR for the Alpha Delta Pier at NAVSTA Mayport was submitted by ABB-ES on behalf of Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM) in November 1992 and the CARA was submitted in April 1993. After submittal of the CARA, a RAP was prepared and submitted to FDEP. The RAP includes a summary of the CAR and CARA and presents remedial alternatives for mitigation of contamination. Text, tables, and figures in the RAP are provided in Appendix B. Materials included in the RAP's Appendix are not included in Appendix B.

In correspondence dated March 4, 1994, FDEP provided technical review comments on the RAP; FDEP's letter is included in Appendix B. Subsequently, a meeting was held between the Navy, FDEP, and ABB-ES on April 13, 1994, to discuss the RAP and FDEP's comments. Based on these discussions, the RAP is being modified to include only free-phase product removal, prevention of the contamination from entering the storm drain system, and quarterly monitoring of the groundwater quality. However, the Navy is still considering conducting bioremedial activities proposed in the RAP.

Because SWMU 29 has been assessed under Chapter 17-770 (now 62-770), FAC, and oversight of assessment and remedial activities is being provided by FDEP, it is recommended that upon the next modification of the HSWA permit SWMU 29 be deleted from the list of sites requiring confirmatory sampling and be transferred to the State of Florida's petroleum site cleanup program (Chapter 62-770, FAC).

<u>2.4 SWMU 46, SHORE INTERMEDIATE MAINTENANCE ACTIVITY (SIMA) ENGINE DRAIN SUMP</u>. The SIMA Engine Drain Sump is located in an engine repair shop (known as 31 Echo), which is located in the eastern half of the SIMA Building (Building 1488) (Figure 2-3). The SIMA Building is located approximately 200 to 400 feet east of Mayport Turning Basin.

As described in the RFA in 1989, in the engine shop, small diesel engines were drained and washed with soap and water over a grate that is approximately 15 square feet. The Engine Drain Sump (SWMU 46) is a holding tank or sump under the grate that collects the drained diesel oil and wash water. During the VSI in 1989, the sump appeared to be constructed of concrete and to be approximately 12 inches in depth and 15 feet square. A drain pipe was visible in the base of the sump and the base appeared to be covered with oil with a metallic sheen. SIMA facility personnel reported that the sump drain led to an underground holding tank located to the west of the western wall of the SIMA Building. SIMA employees interviewed during the VSI were not sure of the exact location of the holding tank and did not know how the tank was cleaned out or who was responsible. Because of the proximity of the underground holding tank to the SIMA oil-water separators (SWMUs 54-E and 54-F), it was thought that the Engine Drain Sump drained to the oil-water separator rather than to an underground holding tank.

Further investigation appeared warranted for SWMU 46 because of the lack of available information regarding the existence, location, and integrity of the equipment used to manage the wastes disposed in the Engine Drain Sump, as well as the highly permeable soil in the site area and the proximity of the SIMA Building to Mayport Turning Basin. Also, it was suggested that the types and locations of the mechanisms used to transport and manage waste from the Engine Drain Sump be determined. It was further suggested that maintenance and repair procedures for these mechanisms be evaluated to determine whether they are adequate to ensure that wastes from the Engine Drain Sump are managed properly and that releases to the environment are prevented.

The 1989 RFA report also suggested that the structural integrity of the sump itself, the drain leading from the sump, and any associated tanks or piping be evaluated. If the structural integrity of any of these items is impaired, it was suggested in the RFA report that the unit should be repaired and localized soil sampling should be conducted to determine whether hazardous constituents have been released to the environment. If hazardous constituents have been released, the RFA report suggested that an RFI would be necessary to characterize the nature and extent of releases to the environment and to determine the need for and allow selection of appropriate corrective measures.

ABB-ES conducted a site visit on May 5, 1994, at SWMU 46. The Engine Drain Sump appeared as described in the RFA. Additionally, during the ABB-ES site visit, drawings were located that illustrate the pipeline route from the Engine Drain Sump and other locations within SIMA (Figures 2-3 and 2-4). The drawing also indicates that there are three oil-water separators (interceptors) at SIMA that

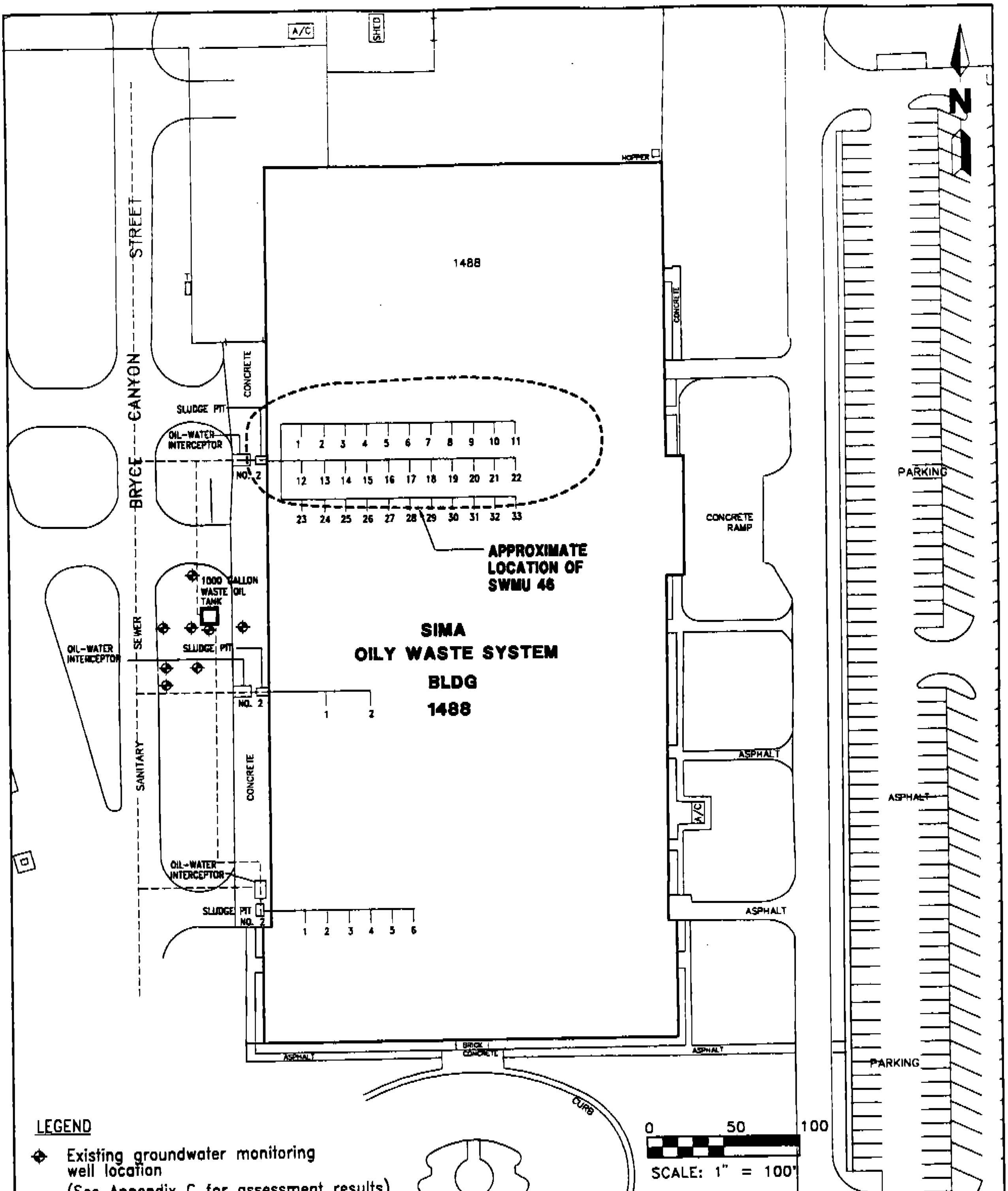

FIGURE 2-3
SWMU 46 SITE MAP,
SHORE INTERMEDIATE MAINTANANCE ACTIVITY
(SIMA)

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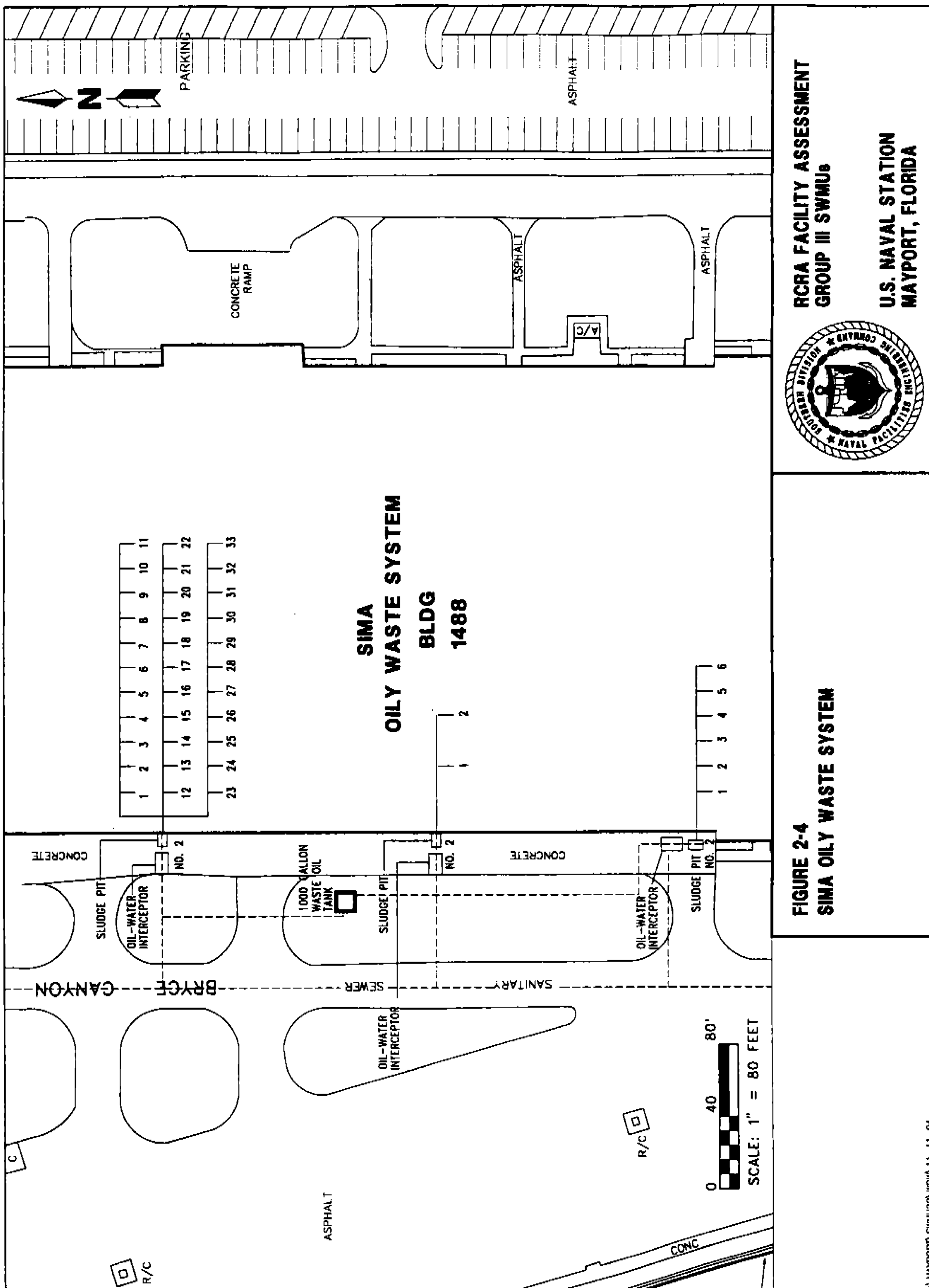

FIGURE 2-4
SIMA OILY WASTE SYSTEM

serve the various locations within the SIMA building. The identity of locations served by the SIMA Oily Waste System in Figure 2-4 are provided in Table 2-1. Drains in the Engine Drain Shop (31 Echo) are numbers 9, 10, and 11.

As suggested by anecdotal evidence obtained during the RFA, the drainage from the Engine Drain Sump flows through a pipeline to a sludge holding tank then to oil-water separator No. 1 on the west side of the SIMA Building (Figures 2-3 and 2-4). Oil recovered at the waste oil tank is stored in a 1,000-gallon capacity underground holding tank and effluent from the oil-water separator flows to the sanitary sewer system.

No RFA/SV sampling activities are proposed for SWMU 46 because SWMU 46 is being assessed under Chapter 62-770, FAC (*State Underground Petroleum Environmental Response*) regulations on petroleum contamination, and FDEP is providing oversight. The State of Florida underground storage tank regulations are similar to or more stringent than the Federal underground storage tank regulations found in the CFR, Title 40, Part 280, *Technical Standards and Corrective Action Requirements for Owner Operators of Underground Storage Tank Programs*), which was revised and published on September 23, 1988, and became effective December 22, 1988.

In October 1989, while installing compliance monitoring wells around the 1,000-gallon capacity waste oil holding tank, petroleum odors were detected in the soil around the tank. As a result of the detection of possible contamination, an assessment was conducted by the U.S. Army Corps of Engineers (USACE). Twelve soil boring and eight monitoring wells (including the compliance monitoring wells) were installed in the immediate vicinity of the 1,000-gallon capacity waste oil tank. The locations of the eight monitoring wells are depicted on Figure 2-3. Free-phase product was found in two of the monitoring wells, with a maximum thickness of 0.17 foot. Soil contamination was found predominantly in the soil backfill around the 1,000-gallon tank.

Reports for SWMU 46 submitted to FDEP include a Contamination Assessment Report (CAR) and a CAR Addendum (CARA). The CAR for the oil-water separator holding tank at SIMA, NAVSTA Mayport was submitted by the USACE, Savannah District on behalf of SOUTHNAVFACENGCOM in May 1993 and the CARA was submitted in September 1993. Text, tables, and figures in the CAR and CARA are provided in Appendix C. Regulatory correspondence concerning the site assessment reports also is included in Appendix C.

In correspondence dated March 10, 1994, the USACE stated that "a contract to remove and replace the underground tank is being initiated and excessively contaminated soil around the tank will be removed." Additionally, free-phase hydrocarbons have not be detected at the site since September 1993.

Because SWMU 46 has been assessed under Chapter 62-770, FAC, and oversight of assessment and remedial activities is being provided by FDEP, it is recommended that upon the next modification of the HSWA permit, SWMU 46 be deleted from the list of sites requiring confirmatory sampling and responsibility be transferred to the State of Florida petroleum site cleanup program (Chapter 62-770, FAC).

Table 2-1
Locations Served by the SIMA Oily Waste System

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U.S. Naval Station Mayport
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No. 1	Oil-Water Separator
1.	Floor drain outside electrical room for fire station.
2.	Floor drain in 17A for fan coil unit.
3.	Floor drain for drain tank in 31E dyno room.
4.	Floor drain in 17A scuttle butt.
5.	Deep sink in 17A and hot water heater.
6.	Floor drain in 26A.
7.	Floor drain in 26A.
8.	Floor drain for emergency eyewash station in injector shop.
9.	Floor drain in 31E for cleaning tank.
10.	Floor drain in 31E for steam tank.
11.	Floor drain in 31E.
12.	Floor drain in 95A for steam line drain.
13.	Deep sink in oil laboratory 95A.
14.	Floor drain in 31E shop for draining P-250 and eyewash station.
15.	Deep sink in oil laboratory 95A.
16	Floor drain in oil laboratory 95A for emergency shower.
17.	Deep sink in "I" division room.
18.	Floor drain in supply warehouse for emergency eyewash station.
19.	Floor drain in NDT 93A for draining developing tanks and control flow.
20.	Deep sink in NDT 93.
21.	Floor drain in NDT 93A for fan coil units 14, 15, and 16.
22.	Floor drain in 57A.
23.	Floor drain in 57A.
24.	Floor drain in 57A.
25.	Floor drain in R-5 bay for 38A air conditioning unit.
26.	Deep sink in R-5 bay and emergency eyewash station.
27.	Floor drain in 57A for deep sink and hot water heater.
28.	Floor drain in 68C steam line discharge and fan coil unit.
29.	Floor drain in 68C.
30.	Floor drain in LP compressor room for discharge of compressor.
31.	Floor drain in LP compressor room for discharge of compressor.
32.	Floor drain in LP compressor room for discharge of compressor.
33.	Deep sink in weight test 72D and eyewash station.
No. 2	Oil-Water Separator
1.	Floor drain in 31A for draining of water after hydro testing, hot water heater, scuttle butt, and eyewash station.
2.	Floor drain in 38A for eyewash station for 31G.
No. 3	Oil-Water Separator
1.	Floor drain in flex hose shop for eyewash station.
2.	Deep sink in flex hose shop.
3.	Floor drain in flex hose shop used for draining water after hydro testing hoses and eyewash station.
4.	Floor drain in AQ&R shop and eyewash station.
5.	Floor drain in electrical shop for fan coil unit 8.
6.	Floor drain in electrical shop for eyewash station and draining wash tank.

Notes: NDT = non-destructive testing.
LP = low pressure.

2.5 SWMU 52, PUBLIC WORKS DEPARTMENT (PWD) SERVICE STATION STORAGE AREA. The PWD Service Station is located at Building 25, which is west of the Destroyer Berthing pier (Figure 2-5). The PWD Service Station Storage Area is located on and adjacent to a concrete slab that is 30 feet long and 20 feet wide and is situated along the northeast wall of the building. There is a drain in the concrete slab that flows to a nearby oil-water separator (Figure 2-4).

At the time of the VSI in 1989, there were at least four 55-gallon drums stored on the concrete slab. Facility personnel indicated that one drum contained window washing solution, one contained coolant, and one contained waste oil. Another drum had an open bung and appeared to be one quarter full of an oily substance. A waste oil bowser of approximately 300-gallon capacity was located on the asphalt just off the northeast edge of the concrete slab. The bowser was reported to be emptied periodically and the oil taken offsite to be recycled. Dark stains were noted beneath the waste oil bowser. A map depicting the features and conditions observed during the VSI was not provided in the RFA report.

Further investigation appeared warranted for SWMU 52 based on the highly permeable soil in the site area, the proximity to Mayport Turning Basin, and the evidence of a release noted during the VSI. It was suggested in the RFA report that soil samples should be collected in the area of the stained asphalt and that the samples should be analyzed for VOCs, SVOCs, and metals. This sampling was to allow an assessment of the nature and extent of release of hazardous constituents.

During the site visit by ABB-ES personnel on May 5, 1994, the site generally appeared as described in the 1989 RFA. However, no drums were present on the pad and in place of the bowser was a small tank (approximately 250 gallons) within a metal containment tub. The tank has metal skids that keep it above the pavement. No staining of the pavement in the area of the tank was observed. A small pipe protrudes from the building wall above the concrete pad. This pipe discharges condensate from an air compressor in the building. Any condensate would ultimately flow into the drain and be processed through the oil-water separator. The oil in the separator is periodically collected for recycling and oil-water effluent flows into the sanitary sewer system. Photographs depicting the current site conditions are presented in Appendix A.

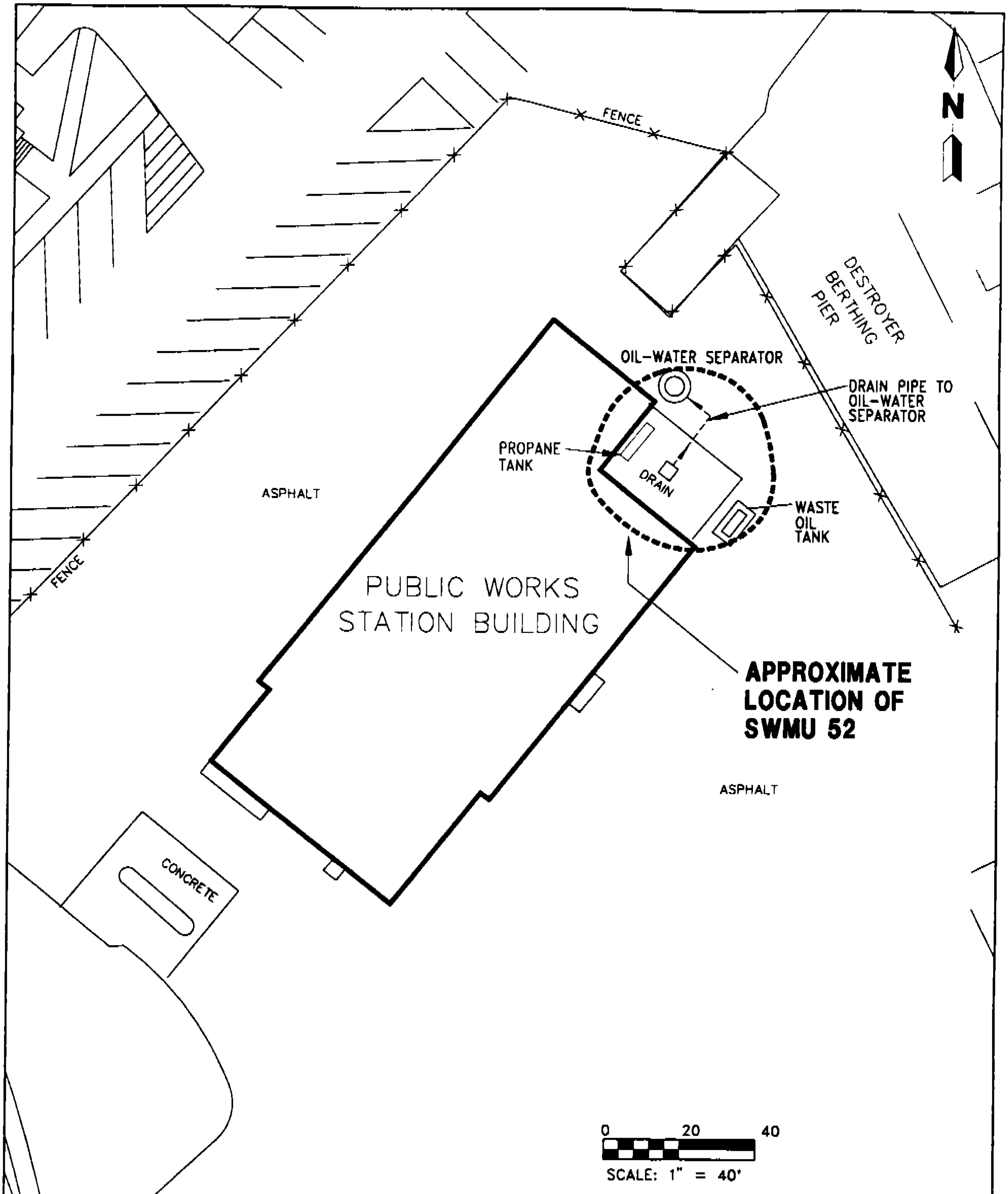

FIGURE 2-5
SWMU 52 SITE MAP,
PUBLIC WORKS DEPARTMENT
SERVICE STATION STORAGE AREA

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3.0 FIELD INVESTIGATION AND SAMPLING PROGRAM

This chapter describes the field sampling activities and standard operating procedures to be conducted for the RFA/SV investigations at Group III. Chapter 2.0, Site Management Plan (SMP), of the RFI workplan, Volume II (ABB-ES, 1991), provides general operating guidelines for site access, security, and field team organization and logistics that will be implemented during RFI activities. The general requirements and procedures described in the SMP will also be followed for the RFA/SV activities outlined in this workplan. Section 3.1, General Site Operations, of the RFI workplan, Volume II, provides descriptions of field personnel responsibilities, sample identification, sample management, chain of custody, project documentation, field changes, corrective actions, decontamination procedures, investigation-derived waste management, and other general project standards and procedures. These requirements will also be followed during the RFA/SV activities.

Field and laboratory QA/QC requirements for the RFA/SV will comply with the RFI QAPP located in Appendix A of the RFI workplan, Volume II. Health and safety requirements will be in accordance with the general HASP located in Volume III of the RFI workplan and the site-specific HASPs located in Appendix D of this RFA/SV workplan.

The environmental samples will be compared to appropriate background samples described in the Technical Memorandum, Background Characterization Activities report for NAVSTA Mayport (ABB-ES, 1994). The objectives of the data gathering activities at the RFA/SV SWMUs are to generate sufficient data from soil and groundwater samples to assess the presence or absence of contamination at the site and to conduct a preliminary risk screening. The RFA/SV sampling and analysis objectives (confirmatory sampling) do not include characterization of the horizontal and vertical extent of contaminants; if contaminants are present, however, site characterization may be required.

3.1 SWMU 20, HOBBY SHOP DRAIN. Available documentation has been reported and summarized in Chapter 2.0. As noted there, the conditions identified in 1989 during the RFA were not observed during the site visit on May 5, 1994, because the site was renovated in 1991. Soil and groundwater sampling will be conducted as recommended in the RFA to address past concerns. This sampling also will be conducted on the east, west, and south perimeters of the site. However, it should be noted that the current site conditions may not reflect the past activities because soil may have been removed during the 1991 construction, and the site has been paved with concrete.

3.1.1 Exploration Program The investigative program at SWMU 20 includes the sampling and analysis of soil and groundwater. Because many of the field activities may be repeated at other sites, they are described as standard operating procedures in project-specific Technical Memoranda located in Appendix D, Technical Memoranda. Site-specific elements particular to SWMU 20 are discussed in subsequent paragraphs, and standard operating procedures are referenced where necessary.

3.1.2 Sampling and Analysis Plan The anticipated designation, frequency, media, sample type, and analyses of soil and sediment samples are summarized in Table 3-1. Proposed soil and groundwater sampling locations are presented in Figure 3-1. Actual sampling locations will be determined depending on site conditions at the time of sampling.

Two surface soil samples will be collected from the stormwater drainage ditch located adjacent to SWMUS 20 and 21 and parallel to Massey Avenue. Surface water samples will also be collected if the ditch contains water during the sampling period. These samples will evaluate the potential for contaminants to have been carried along with stormwater runoff.

The RFA report (A.T. Kearney, Inc., 1989) indicated that the Hobby Shop Drain was located near the southeastern part of Building 1227 (Building 1277A, See Figure 3-1). Monitoring well MPT-20-MW1 is proposed to be placed at this location.

The RFA report (A.T. Kearney, Inc., 1989) indicated that the Hobby Shop Drain was located at the southeast corner of Building 1277. The surface topography in this area slopes gently to the south. The location of monitoring well MPT-20-MW2 is proposed to identify effects of the Hobby Shop Drain on the surface soil, subsurface soil, and groundwater in this area. Any effects from the nearby waste oil storage area would also be addressed by the samples from this location. In addition, the current parking lot drain between Buildings 1277A and 414 discharges to a small grassy swale.

The RFA report (A.T. Kearney, Inc., 1989) indicated that the outlet for the Hobby Shop Drain could be seen at the edge of the parking lot on the western side of Building 1277. The location of monitoring well MPT-20-MW3 is proposed to address the potential for contaminants to have been released to the environment from discharge of the drain. In addition, the oil-water separator for the current waste oil recovery system is located on the western side of Building 1277 (now Building 1277A).

Environmental samples proposed at each monitoring well location will consist of the following: one surface soil sample collected at 0 to 1 foot below land surface (bls), one subsurface soil sample collected just above the water table, and one groundwater sample collected from the water table zone of the surficial aquifer, estimated well screen interval of 5 to 15 feet bls. Six soil (three surface and three subsurface) samples and three groundwater samples will be collected at SWMU 20. Subsurface soil samples are not planned to be collected between the surface soil sample interval (0 to 1 foot bls) and the subsurface soil sample interval based on the reported depth to groundwater of 2.7 to 4.3 feet bls (USACE, 1992) at SWMU 46 SIMA, which is located approximately 900 feet to the northwest of SWMUs 20 and 21 (Figure 1-2).

Surface soil sampling will be conducted as described in the Technical Memorandum, *Surface Soil Sampling*, Appendix D. Drilling and subsurface soil sampling will be collected as described in the Technical Memorandum, *Drilling and Subsurface Soil Sampling*, Appendix D. The groundwater sampling procedure is a modification of previous sampling methods; however, it closely resembles a method proposed by USEPA (1994). Prior to groundwater sample collection, the monitoring well will be purged using a peristaltic pump to remove stagnant water without causing the

Table 3-1
Summary of Samples to be Collected at SWMU 20 (Hobby Shop Drain) and SWMU 21 (Hobby Shop Scrap Storage Area)

RFA/SV Workplan, Group III
U.S. Naval Station Mayport
Mayport, Florida

Sample Designation	Sample Type	Depth (feet bls)	Media	USEPA Method Number			
				8240	8270	6010, 7470, 7480, 9010	8080
				VOC	SVOC	Metals and Cyanide	Pest/PCB
MPT-20-SS1	Surface	0 to 1	Soil	1	1	1	1
MPT-20-SS2	Surface	0 to 1	Soil	1	1	1	1
MPT-20-SS3	Surface	0 to 1	Soil	1	1	1	1
MPT-20-SS4	Surface	0 to 1	Soil	1	1	1	1
MPT-20-SS5	Surface	0 to 1	Soil	1	1	1	1
MPT-21-SS1	Surface	0 to 1	Soil	1	1	1	1
MPT-21-SS2	Surface	0 to 1	Soil	1	1	1	1
MPT-21-SS3	Surface	0 to 1	Soil	1	1	1	1
Duplicates/MS/MSD	Surface	0 to 1	Soil	3	3	3	3
			Subtotal	11	11	11	11
MPT-20-BS1	Subsurface	7 to 8	Soil	2	2	2	2
MPT-20-BS2	Subsurface	7 to 8	Soil	2	2	2	2
MPT-20-BS3	Subsurface	7 to 8	Soil	2	2	2	2
MPT-21-BS1	Subsurface	7 to 8	Soil	2	2	2	2
MPT-21-BS2	Subsurface	7 to 8	Soil	2	2	2	2
MPT-21-BS3	Subsurface	7 to 8	Soil	2	2	2	2
Duplicates/MS/MSD	Subsurface	7 to 8	Soil	6	6	6	6
			Subtotal	18	18	18	18
MPT-20-MW1	Groundwater	5 to 15	Water	1	1	1	1
MPT-20-MW2	Groundwater	5 to 15	Water	1	1	1	1
MPT-20-MW3	Groundwater	5 to 15	Water	1	1	1	1
MPT-21-MW1	Groundwater	5 to 15	Water	1	1	1	1
MPT-21-MW2	Groundwater	5 to 15	Water	1	1	1	1
MPT-21-MW3	Groundwater	5 to 15	Water	1	1	1	1
Duplicates/MS/MSD	Groundwater	5 to 15	Water	3	3	3	3
			Subtotal	9	9	9	9

See notes at end of table.

Table 3-1 (Continued)
Summary of Samples to be Collected at SWMU 20 (Hobby Shop Drain) and SWMU 21 (Hobby Shop Scrap Storage Area)

RFA/SV Workplan, Group III
U.S. Naval Station Mayport
Mayport, Florida

Sample Designation	Sample Type	Media	USEPA Method Number 8240 VOC	8270 SVOC	6010, 7470, 7480, 9010 Metals and Cyanide	8080 Pest/PCB
MPT-20-QS1	QC rinsate blank	Water	1	1	1	1
MPT-21-QS1	QC rinsate blank	Water	1	1	1	1
MPT-20-TB1	QC trip blank	Water	1	0	0	0
MPT-21-TB1	QC trip blank	Water	1	0	0	0
MPT-20-FB1	QC field blank	Water	1	1	1	1
		Subtotal	5	3	3	3
		Total	43	41	41	41

Notes: SWMU = Solid Waste Management Unit.
bls = below land surface.
USEPA = U.S. Environmental Protection Agency.
VOC = volatile organic compound.
SVOC = semivolatile organic compound.
Pest/PCB = pesticides and polychlorinated biphenyls.
Duplicates/MS/MSD = duplicate, matrix spike, and matrix spike duplicate (MS/MSD) samples.
QC = quality control.

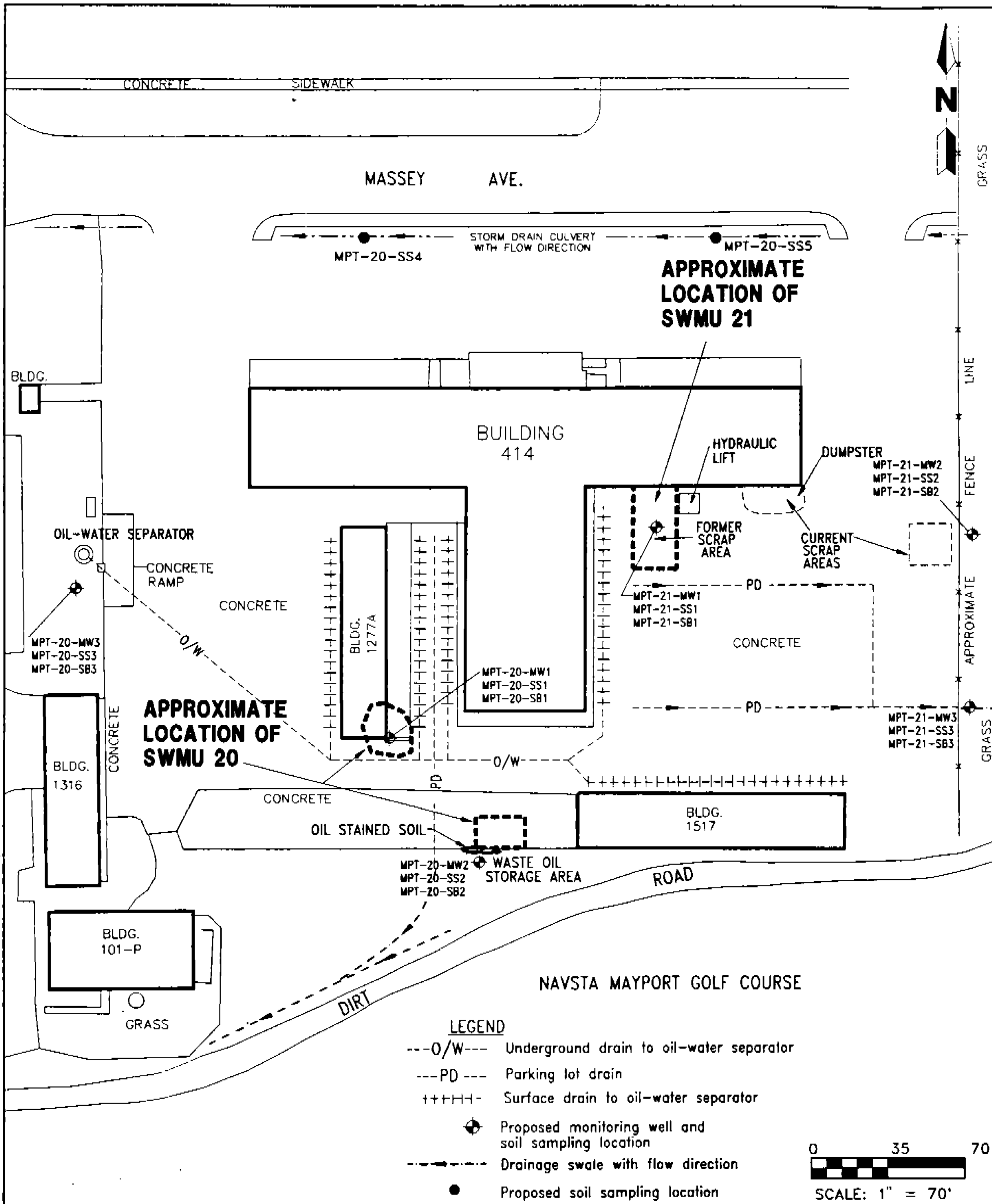

FIGURE 3-1
PROPOSED SOIL AND GROUNDWATER SAMPLING LOCATIONS AT SWMUs 20 AND 21

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resuspension of silts and clays. Turbidity, temperature, pH, and conductivity will be measured during purging to ensure good conductance between the well and the surrounding matrix. The monitoring well will be purged until temperature, conductivity, and pH have stabilized and a minimum of three well volumes of water have been removed. Purging will continue until the turbidity is below 5 nephelometric turbidity units (NTUs) or until the field operation leader believes further purging will not significantly decrease the turbidity (this decision will only be made after several hours of purging). A filtered and a non-filtered sample will be collected at each well that has turbidity greater than 5 NTU.

Except for VOCs, all groundwater samples will be collected using a peristaltic pump and disposable Teflon™ tubing. The samples will be collected before the material comes in contact with the pump. VOCs will be collected last. The sampler will try to prevent agitation of the water in the monitoring well by slowly lowering an open-bottom type bailer in the water. The bailer contents will be carefully transferred to a VOC vial for shipment to the laboratory. Soil sample locations will be chosen to bias the sampling toward areas most likely to be contaminated based on existing site knowledge.

Samples will be analyzed for selected VOCs, SVOCs, polychlorinated biphenyls (PCBs), and metals listed in the groundwater monitoring list contained in Appendix IX, 40 CFR 264. Specific analytes will be selected that are representative of potential contaminants associated with known facility activities. Appendix IX parameters are listed in Table 4-1 of Chapter 4.0 for reference.

<u>3.2 SWMU 21, HOBBY SHOP SCRAP STORAGE AREA</u>. Available documentation has been reported and summarized in Chapter 2.0. As noted there, the items identified in 1989 for the RFA were not observed during the site visit on May 5, 1994, because the site was renovated in 1991. Soil and groundwater sampling will be conducted at the location described in the RFA report (A.T. Kearney, Inc., 1989) as the location of SWMU 21, along the eastern perimeter of the site near the former and present scrap storage areas, and where the parking lot drain discharges. However, it should be noted that current site conditions may not reflect past activities because soil may have been removed during the 1991 construction, and the entire site has been paved with concrete.

<u>3.2.1 Exploration Program</u> The investigative program at SWMU 21 includes the sampling and analysis of soil and groundwater. Because many of the field activities may be repeated at other sites, they are described as standard operating procedures in project-specific Technical Memoranda located in Appendix D, Technical Memoranda. Site-specific elements particular to SWMU 21 are discussed in subsequent paragraphs, and standard operating procedures are referenced where necessary.

<u>3.2.2 Sampling and Analysis Plan</u> The anticipated designation, frequency, media, and sample types and analyses of soil samples are summarized in Table 3-1. Proposed soil sampling and groundwater monitoring well locations are presented in Figure 3-1. In the RFA report (A.T. Kearney, Inc., 1989), it was described that the Hobby Shop Scrap Area was adjacent to the southern wall of the east wing of Building 414, approximately 20 feet from the southeastern corner of the wing. During 1991, renovation of the site included removing the pavement along with some of the underlying soil, and repaving the site with concrete. Monitoring

well MPT-21-MW1 is proposed to be located at the former scrap storage area as described in the RFA report (A.T. Kearney, Inc., 1989).

The current scrap area is on the new concrete pavement about 75 feet to the east of the former area, along the boundary of the site. The proposed location of monitoring well MPT-21-MW2 is to assess effects of the past and current scrap areas on the surface soil, subsurface soil, and groundwater. Environmental sampling location MPT-21-MW3 also will provide information with regard to the effects of the scrap areas and whether the parking lot drain discharge area has been adversely impacted.

Environmental samples proposed at the monitoring well locations will consist of the following: one surface soil sample collected at 0 to 1 foot bls, one subsurface soil sample collected just above the water table, and one groundwater sample collected from the water table zone of the surficial aquifer, estimated well screen interval of 5 to 15 feet bls. Surface soil sample locations will be biased to location where staining is evident, such as the drain at the waste oil storage area (Figure 3-1). Six soil (three surface and three subsurface) samples will be collected at SWMU 21. Subsurface soil samples are not planned to be collected between the surface soil sample interval (0 to 1 foot bls) and the subsurface soil sample interval based on the depth to groundwater of 2.7 to 4.3 feet bls (USACE, 1992) at SWMU 46 SIMA, which is located approximately 900 feet to the northwest of SWMUs 20 and 21 (Figure 1-2).

Surface soil sampling will be conducted as described in the Technical Memorandum, *Surface Soil Sampling*, Appendix D. Drilling and subsurface soil sampling will be collected as described in the Technical Memorandum, *Drilling and Subsurface Soil Sampling*, Appendix D. The groundwater sampling procedure is a modification of previous sampling methods; however, it closely resembles a method proposed by USEPA (1994). Prior to groundwater sample collection, the monitoring well will be purged using a peristaltic pump to remove stagnant water without causing the resuspension of silts and clays. Turbidity, temperature, pH, and conductivity will be measured during purging to ensure good conductance between the well and the surrounding matrix. The monitoring well will be purged until temperature, conductivity, and pH have stabilized and a minimum of three well volumes of water have been removed. Purging will continue until the turbidity is below 5 NTUs or until the field operation leader believes further purging will not significantly decrease the turbidity (this decision will only be made after several hours of purging). A filtered and a non-filtered sample will be collected at each well that has turbidity greater than 5 NTU.

Except for VOCs, all groundwater samples will be collected using a peristaltic pump and disposable Teflon™ tubing. The samples will be collected before the material comes in contact with the pump. VOCs will be collected last. The sampler will try to prevent agitation of the water in the monitoring well by slowly lowering an open-bottom type bailer in the water. The bailer contents will be carefully transferred to a VOC vial for shipment to the laboratory. Soil sample locations will be chosen to bias the sampling toward areas most likely to be contaminated based on existing site knowledge.

Samples will be analyzed for target analytes selected from both the Groundwater Monitoring List contained in 40 CFR 264, Appendix IX, and USEPA's Contract Laboratory Program target compound list and target analyte list. These target analytes are described in Chapter 4.0, Analytical Program. Specific analytes will be selected that are representative of potential contaminants associated with known facility activities. Appendix IX parameters are listed in Table 4-1 of Chapter 4.0 for reference.

3.3 **SWMU 52, PWD SERVICE STATION STORAGE AREA**. Based on recommendations in the RFA report, soil and groundwater sampling will be conducted in the vicinity of the concrete pad, drain, oil tank, and oil-water separator to assess whether releases of hazardous constituents have occurred at SWMU 52. The objectives of the data gathering activities at SWMU 52 are to obtain sufficient surface soil, subsurface soil, and groundwater samples to assess the presence or absence of contamination at the site and to conduct a preliminary risk screening. The RFA/SV sampling and analysis objectives do not include characterization of the horizontal and vertical extent of contaminants, if present; however, site characterization may be required.

3.3.1 **Exploration Program** The exploration program at SWMU 52 includes collection of surface and subsurface soil samples and a groundwater sample. The SWMU 52 groundwater analytical results will be compared to analytical results of the appropriate background samples described in the Draft Technical Memorandum, Background Characterization Activities report for NAVSTA Mayport (ABB-ES, 1994).

3.3.2 **Sampling and Analysis Plan** The anticipated designation, frequency, media, and sample types and analyses of soil samples are summarized in Table 3-2. Proposed soil sampling and groundwater monitoring well locations are presented in Figure 3-2. Surface soil sampling will be conducted as described in the Technical Memorandum, *Surface Soil Sampling*, Appendix D. Drilling and subsurface soil sampling will be collected as described in the Technical Memorandum, *Drilling and Subsurface Soil Sampling*, Appendix D. The groundwater sampling procedure is a modification of previous sampling methods; however, it closely resembles a method proposed by USEPA (1994). Prior to groundwater sample collection, the monitoring well will be purged using a peristaltic pump to remove stagnant water without causing the resuspension of silts and clays. Turbidity, temperature, pH, and conductivity will be measured during purging to ensure good conductance between the well and the surrounding matrix. The monitoring well will be purged until temperature, conductivity, and pH have stabilized and a minimum of three well volumes of water have been removed. Purging will continue until the turbidity is below 5 NTUs or until the field operation leader believes further purging will not significantly decrease the turbidity (this decision will only be made after several hours of purging). A filtered and a non-filtered sample will be collected at each well that has turbidity greater than 5 NTU.

Except for VOCs, all groundwater samples will be collected using a peristaltic pump and disposable Teflon™ tubing. The samples will be collected before the material comes in contact with the pump. VOCs will be collected last. The sampler will try to prevent agitation of the water in the monitoring well by slowly lowering an open-bottom type bailer in the water. The bailer contents will be carefully transferred to a VOC vial for shipment to the laboratory.

The RFA report (A.T. Kearney, Inc., 1989) described items of potential concern located in the area of the concrete pad at the rear of Building 25. These items included drums, a bowser, and a drain leading to an oil-water separator. The location of monitoring well MPT-52-MW1 is proposed to identify the effects of these items on the surface soil (beneath the pavement), subsurface soil, and groundwater in that area (Figure 3-2).

Table 3-2
Summary of Samples to be Collected at SWMU 52 (PWD Service Station Area)

RFA/SV Workplan, Group III
U.S. Naval Station Mayport
Mayport, Florida

Sample Designation	Sample Type	Depth (feet bls)	Media	USEPA Method Number			
				8240	8270	6010, 7470, 7480, 9010	8080
				VOC	SVOC	Metals and Cyanide	Pest/PCBs
MPT-52-SS1	Surface	0 to 1	Soil	1	1	1	1
Duplicates/MS/MSD	Surface	0 to 1	Soil	3	3	3	3
MPT-52-BS1	Subsurface	3 to 4	Soil	1	1	1	1
MPT-52-MW1	Groundwater	5 to 15	Water	1	1	1	1
Duplicates/MS/MSD	Groundwater	TBD	Water	3	3	3	3
			Subtotal	9	9	9	9
MPT-52-QS1	QC rinsate blank		Water	1	1	1	1
MPT-52-QS2	QC rinsate blank		Water	1	1	1	1
MPT-52-TB1	QC trip blank		Water	1	0	0	0
MPT-52-FB2	QC field blank		Water	1	1	1	1
			Subtotal	4	3	3	3
			Total	13	12	12	12

Notes: SWMU = Solid Waste Management Unit.
PWD = Public Works Department.
bls = below land surface.
USEPA = U.S. Environmental Protection Agency.
VOC = volatile organic compound.
SVOC = semivolatile organic compound.
Pest/PCBs = pesticides and polychlorinated biphenyls
Duplicates/MS/MSD = duplicate, matrix spike, and matrix spike duplicate (MS/MSD) samples.
TBD = to be determined in the field.
QC = quality control.

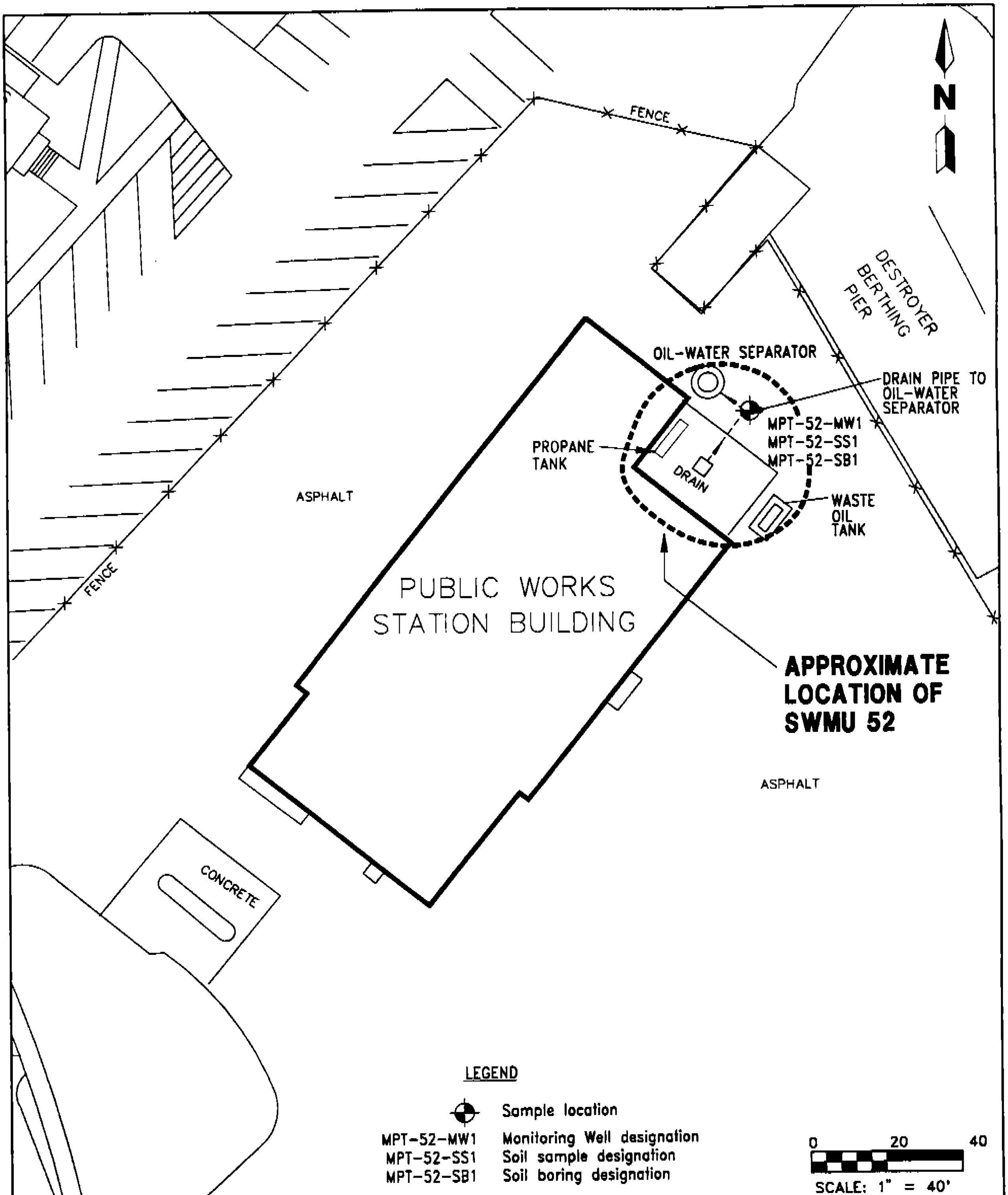

FIGURE 3-2
PROPOSED SOIL AND GROUNDWATER SAMPLING LOCATION AT SWMU 52

RCRA FACILITY ASSESSMENT GROUP III SWMUs

U.S. NAVAL STATION MAYPORT, FLORIDA

MAYPORT\SWMU20\WDW\11-11-94

One monitoring well will be located in the apparent downgradient side of SWMU 52. Environmental samples proposed at the monitoring well location will consist of the following: one surface soil sample collected at 0 to 1 foot bls, one subsurface soil sample collected just above the water table, and one groundwater sample collected from the water table zone of the surficial aquifer, estimated well screen interval of 5 to 15 feet bls. A subsurface soil sample is not planned to be collected between the surface soil sample interval (0 to 1 foot bls) and the subsurface soil sample interval based on a depth to groundwater of approximately 4 feet at SWMU 29, Alpha-Delta Pier (ABB-ES, 1993b).

Samples will be analyzed for target analytes selected from both the Groundwater Monitoring List contained in Chapter 40 CFR 264, Appendix IX, and USEPA's Contract Laboratory Program target compound list and target analyte list. These target analytes are described in Section 4.0, Analytical Program. Specific analytes will be selected that are representative of potential contaminants associated with known facility activities. Appendix IX parameters are listed in Table 4-1 of Chapter 4.0 for reference.

4.0 ANALYTICAL PROGRAM

The analytical program for the Group III RFA/SV at NAVSTA Mayport will address analytes selected from both the 40 CFR 264, Appendix IX, groundwater monitoring list and the USEPA Contract Laboratory Program target compound list and target analyte list (Tables 4-1 through 4-4). Tables 4-1 through 4-4 provide a summary of target analytes in both lists, current target analytes, and target analytes that have been detected in previous investigations at NAVSTA Mayport. Gas chromatography and mass spectroscopy (GC/MS) methods will be used for analyses of environmental and QA/QC samples. Specifically, USEPA Method 8240 will be used to analyze for VOCs (Table 4-1) and USEPA Method 8270 will be used to analyze for SVOCs (Table 4-2). USEPA Method 8080 will be used to analyze for chlorinated pesticides and PCBs (Table 4-3). Organophosphorus pesticides (USEPA 8140) and chlorinated herbicides (USEPA Method 8150) are target analytes only at sites known to be used for pesticide storage, handling, and mixing. No such sites have been identified at Group III; therefore, analyses will not be conducted for organophosphorus pesticides, and chlorinated herbicides. Selected metals will be analyzed by inductively coupled plasma (ICP), graphite furnace atomic absorption (GFAA), or cold vapor atomic absorption (CVAA), as appropriate (e.g., USEPA Methods 6010, 7420, or 7470) (Table 4-4). USEPA Method 9010 will be used to analyze for cyanide.

DQOs for VOCs, SVOCs, pesticides, PCBs, and solid matrix inorganics will be NEESA Level C. DQOs for aqueous matrix inorganics will be NEESA Level D. The NEESA Level D DQO will be used to assess the analytical data for false positive or negative results.

The number of field and laboratory QA/QC samples to be collected will be in accordance with the generic Quality Assurance Program Plan (QAPP), Appendix A, Volume II, of the NAVSTA Mayport RFI Workplan (ABB-ES, 1991). Field and laboratory QA/QC samples will be analyzed by the same analytical methods as the associated environmental samples. The following presents a brief description of field QA/QC samples that will be collected.

- **Duplicates**. Duplicates of soil, waste, groundwater, surface water, and sediment samples will be submitted for analyses at a rate of 10 percent of the samples analyzed, or a minimum of 1 per event for each media sampled.

- **Trip Blanks**. A trip blank will be included with each shipment of samples scheduled for VOC analysis and will be analyzed with other VOC samples.

- **Equipment Rinsate Blanks**. A minimum of one equipment rinsate (sampler) blank per week per media will be collected from each piece of equipment used in the sampling event (bailers, sampling pumps, and/or tubing). If equipment is decontaminated in the field, then a minimum of two equipment rinsate blanks will be collected each day. One will be collected at the initiation of daily sampling activities and the other at the completion.

- **Field Blanks**. A field blank or source water blank will be collected at a rate of at least one blank per field event or every 10 days, whichever is greater. The source blank monitors water used by the field operations for daily operations.

Table 4-1
Gas Chromatograph amd Mass Spectrometer Volatiles
Comparison of Target Analytes From Resource Conservation and Recovery Act Appendix IX Ground Water Monitoring List and U.S. Environmental Protection Agency Contract Laboratory Program Target Compound List

RFA/SV Workplan, Group III
U.S. Naval Station Mayport
Mayport, Florida

Volatile Organic Compounds	Appendix IX	CLP TCL	Currently A Target Analyte	Detected at NAVSTA Mayport
Chloromethane		✓	✓	
Bromomethane		✓	✓	
Vinyl chloride	✓	✓	✓	
Chloroethane	✓	✓	✓	
Methylene chloride	✓	✓	✓	✓
Acetone	✓	✓	✓	✓
Carbon disulfide	✓	✓	✓	✓
Trichlorofluoromethane	✓		✓	✓
1,1-Dichloroethene	✓	✓	✓	
1,1-Dichloroethane	✓	✓	✓	✓
1,2-Dichloroethene (total)	✓	✓	✓	
Chloroform	✓	✓	✓	✓
1,2-Dichloroethane	✓	✓	✓	
2-Butanone	✓	✓	✓	✓
1,1,1-Trichloroethane	✓	✓	✓	
Carbon tetrachloride	✓	✓	✓	
Bromodichloromethane	✓	✓	✓	✓
1,2-Dichloropropane	✓	✓	✓	
cis-1,3-Dichloropropene	✓	✓	✓	
Trichloroethene	✓	✓	✓	✓
Benzene	✓	✓	✓	✓
Dibromochloromethane	✓	✓	✓	✓
1,1,2-Trichloroethane	✓	✓	✓	
trans-1,3-Dichloropropene	✓	✓	✓	
2-Chloroethylvinylether			✓	
Bromoform	✓	✓	✓	
2-Hexanone	✓	✓	✓	
Tetrachloroethene	✓	✓	✓	
1,1,2,2-Tetrachloroethane	✓	✓	✓	✓
Toluene	✓	✓	✓	✓
Chlorobenzene	✓	✓	✓	✓
Ethylbenzene	✓	✓	✓	✓
Styrene	✓	✓	✓	
Xylenes (total)				
See notes at end of table.				

Table 4-1 (Continued)
Gas Chromatograph and Mass Spectrometer Volatiles
Comparison of Target Analytes From Resource Conservation and Recovery Act Appendix IX Ground Water Monitoring List and U.S. Environmental Protection Agency Contract Laboratory Program Target Compound List

RFA/SV Workplan, Group III
U.S. Naval Station Mayport
Mayport, Florida

Volatile Organic Compounds	Appendix IX	CLP TCL	Currently A Target Analyte	Detected at NAVSTA Mayport
4-Methyl-2-pentanone	✓	✓	✓	
1,3-Dichlorobenzene	✓		✓	
1,4-Dichlorobenzene	✓		✓	✓
1,2-Dichlorobenzene	✓		✓	
Acetonitrile	✓		✓	✓
Acrolein	✓		✓	✓
Acrylonitrile	✓		✓	
Chloroprene	✓		✓	
3-Chloropropene	✓		✓	
1,2-Dibromo-3-chloropropane	✓		✓	✓
1,2-Dibromoethane	✓		✓	
Dibromomethane	✓		✓	
1,4-Dioxane	✓		✓	
Propionitrile	✓		✓	
Ethyl Methacrylate	✓		✓	
Iodomethane	✓		✓	
Isobutyl alcohol	✓		✓	
Methacrylonitrile	✓		✓	
Methyl methacrylate	✓		✓	
Vinyl acetate	✓		✓	
Trans-1,4-dichloro-2-butene	✓		✓	
Dichlorodifluoromethane	✓		✓	
Pentachloroethane	✓		✓	
1,1,1,2-Tetrachloroethane	✓		✓	
1,2,3-Trichloropropane	✓		✓	

Notes: ✓ = Target analytes for environmental and quality control samples collected at each Solid Waste Management Unit.

Appendix IX = 40 Code of Federal Regulations Part 264, Appendix IX, Ground Water Monitoring List. Analytical Methodology for Appendix IX is Test Methods for Evaluation of Solid Wastes, US EPA, SW 846, Third Edition, November, 1986. (And Proposed Update Package, 1989.)

CLP TCL = U.S. Environmental Protection Agency Contract Laboratory Program, Statement of Work for Organic Analysis, Multi-Media, Multi-Concentration, Exhibit C, Target Compound List and Contract Required Quantitation Limits, OLM01.0, July 1993.

Table 4-2
Gas Chromatograph and Mass Spectrometer Semivolatiles Comparison of Target Analytes From Resource Conservation and Recovery Act Appendix IX Ground Water Monitoring List and U.S. Environmental Protection Agency Contract Laboratory Program Target Compound List

RFA/SV Workplan, Group III
U.S. Naval Station Mayport
Mayport, Florida

Semivolatile Organic Compounds	Appendix IX	CLP TCL	Currently A Target Analyte	Detected at NAVSTA Mayport
Acid Extractables				
Phenol	✓	✓	✓	✓
2-Chlorophenol	✓	✓	✓	
2-Methylphenol	✓	✓	✓	✓
4-Methylphenol	✓	✓	✓	✓
2-Nitrophenol	✓	✓	✓	
2,4-Dimethylphenol	✓	✓	✓	✓
2,4-Dichlorophenol	✓	✓	✓	
4-Chloro-3-methylphenol	✓	✓	✓	
2,4,6-Trichlorophenol	✓	✓	✓	
2,4,5-Trichlorophenol	✓	✓	✓	
2,4-Dinitrophenol	✓	✓	✓	
4-Nitrophenol	✓	✓	✓	
2-Methyl-4,6-dinitrophenol	✓	✓	✓	
Pentachlorophenol	✓	✓	✓	✓
2,3,4,6-Tetrachlorophenol	✓		✓	
2,6-Dichlorophenol	✓		✓	
Benzoic Acid			✓	✓
Base-Neutral Compounds				
1,3-Dichlorobenzene[1]	✓	✓	✓	
1,4-Dichlorobenzene[1]	✓	✓	✓	
1,2-Dichlorobenzene[1]	✓	✓	✓	
Hexachloroethane	✓	✓	✓	
1,2,4-Trichlorobenzene	✓	✓	✓	
Naphthalene[2]	✓	✓	✓	✓
Hexachlorobutadiene	✓	✓	✓	
Hexachlorocyclopentadiene	✓	✓	✓	
2-Chloronaphthalene	✓	✓	✓	
Acenaphthylene[2]	✓	✓	✓	
Acenaphthene[2]	✓	✓	✓	✓
Dibenzofuran	✓	✓	✓	✓
Fluorene[2]	✓	✓	✓	✓
4-Chlorophenyl-phenylether	✓	✓	✓	
4-Bromophenyl-phenylether				

See notes at end of table.

Table 4-2 (Continued)
Gas Chromatograph and Mass Spectrometer Semivolatiles
Comparison of Target Analytes From Resource Conservation and Recovery Act Appendix IX Ground Water Monitoring List and U.S. Environmental Protection Agency Contract Laboratory Program Target Compound List

RFA/SV Workplan, Group III
U.S. Naval Station Mayport
Mayport, Florida

Semivolatile Organic Compounds	Appendix IX	CLP TCL	Currently A Target Analyte	Detected at NAVSTA Mayport
Hexachlorobenzene	✓	✓	✓	
Phenanthrene[2]	✓	✓	✓	✓
Anthracence[2]	✓	✓	✓	✓
Fluoranthene[2]	✓	✓	✓	✓
Pyrene[2]	✓	✓	✓	✓
Benzo(a)anthracene[2]	✓	✓	✓	✓
Chrysene[2]	✓	✓	✓	✓
Benzo(b)fluoranthene[2]	✓	✓	✓	✓
Benzo(k)fluoranthene[2]	✓	✓	✓	
Benzo(a)pyrene[2]	✓	✓	✓	✓
Indeno(1,2,3-cd)pyrene[2]	✓	✓	✓	
Dibenzo(a,h)anthracene[2]	✓	✓	✓	
Benzo(g,h,i)perylene[2]	✓	✓	✓	✓
bis(2-Chloroethyl)ether	✓		✓	
n-Nitroso-di-n-propylamine	✓	✓	✓	
Nitrobenzene	✓	✓	✓	
Isophorone	✓	✓	✓	
bis(2-Chloroethoxy)methane	✓	✓	✓	
Dimethylphthalate	✓	✓	✓	
2,6-Dinitrotoluene	✓	✓	✓	
2,4-Dinitrotoluene	✓	✓	✓	
Diethylphthalate	✓	✓	✓	✓
n-Nitrosodiphenylamine	✓	✓	✓	
di-n-Butylphthalate	✓	✓	✓	✓
Butylbenzylphthalate	✓	✓	✓	✓
3,3'-Dichlorobenzidine	✓	✓	✓	
bis(2-Ethylhexyl)phthalate	✓	✓	✓	✓
di-n-Octylphthalate	✓	✓	✓	✓
n-Nitrosodimethylamine	✓		✓	✓
2-Picoline	✓		✓	
Diphenylamine	✓		✓	
4-Nitroaniline	✓	✓	✓	
Benzyl alcohol	✓		✓	
n-Nitrosopiperidine	✓		✓	
n-Nitrosomethylethylamine	✓		✓	
4-Chloroaniline	✓	✓	✓	
p-Phenylenediamine	✓		✓	
See notes at end of table.				

Table 4-2 (Continued)
Gas Chromatograph and Mass Spectrometer Semivolatiles
Comparison of Target Analytes From Resource Conservation and Recovery Act Appendix IX Ground Water Monitoring List and U.S. Environmental Protection Agency Contract Laboratory Program Target Compound List

RFA/SV Workplan, Group III
U.S. Naval Station Mayport
Mayport, Florida

Semivolatile Organic Compounds	Appendix IX	CLP TCL	Currently A Target Analyte	Detected at NAVSTA Mayport
3- and 4-Methylphenol				
bis(2-Chloroisopropyl)ether	✓	✓	✓	
Pyridine	✓		✓	
3,3'-Dimethylbenzidine	✓		✓	
Isosafrole	✓		✓	
Phenyl-tert-butylamine	✓		✓	
1,2-Diphenylhydrazine			✓	
1,4-Naphthoquinone	✓		✓	
1-Naphthylamine	✓		✓	
Aramite	✓		✓	
Hexachloropropene	✓		✓	
Pronamide	✓		✓	
2-Acetylaminofluorene	✓		✓	✓
n-Nitrosodiethylamine	✓		✓	
3-Methylcholanthrene	✓		✓	
4-Nitroquinoline-1-oxide	✓		✓	
7,12-Dimethylbenz(a)anthracene	✓		✓	
n-Nitrosomorpholine	✓		✓	
p-(Dimethylamino)azobenzene	✓		✓	
Pentachlorobenzene	✓		✓	
Phenacetin	✓		✓	
Ethyl methanesulfonate	✓		✓	
Aniline	✓		✓	
Methyl methanesulfonate	✓		✓	
Hexachlorophene	✓		✓	
Pentachloronitrobenzene	✓		✓	
2-Nitroaniline	✓	✓	✓	
2-Methylnaphthalene[2]	✓	✓	✓	✓
2-Naphthylamine	✓		✓	
Methapyrilene	✓		✓	
4-Aminobiphenyl	✓		✓	
Benzidine			✓	
n-Nitroso-di-n-butylamine	✓		✓	
n-Nitrosopyrrolidine	✓		✓	
Safrole	✓		✓	
o-Toluidine	✓		✓	
1,2,4,5-Tetrachlorobenzene	✓		✓	
See notes at end of table.				

Table 4-2 (Continued)
Gas Chromatograph and Mass Spectrometer Semivolatiles
Comparison of Target Analytes From Resource Conservation and Recovery Act Appendix IX Ground Water Monitoring List and U.S. Environmental Protection Agency Contract Laboratory Program Target Compound List

RFA/SV Workplan, Group III
U.S. Naval Station Mayport
Mayport, Florida

Semivolatile Organic Compounds	Appendix IX	CLP TCL	Currently A Target Analyte	Detected at NAVSTA Mayport
Acetophenone	✓		✓	
3-Nitroaniline	✓	✓	✓	
1,3,5-Trinitrobenzene	✓		✓	
5-Nitro-o-toluidine	✓		✓	
1,3-Dinitrobenzene	✓		✓	
Carbazole		✓		

[1] Analyte is both a volatile and semivolatile target analyte.
[2] Analyte is a polynuclear aromatic hydrocarbon.

Notes: ✓ = Target analytes for environmental and quality control samples collected at each Solid Waste Management Unit.

Appendix IX = 40 Code of Federal Regulations Part 264, Appendix IX, Ground Water Monitoring List. Analytical Methodology for Appendix IX is Test Methods for Evaluation of Solid Wastes, US EPA, SW 846, Third Edition, November, 1986. (And Proposed Update Package, 1989.)

CLP TCL = U.S. Environmental Protection Agency Contract Laboratory Program, Statement of Work for Organic Analysis, Multi-Media, Multi-Concentration, Exhibit C, Target Compound List and Contract Required Quantitation Limits, OLM01.0, July 1993.

Table 4-3
Gas Chromatograph Pesticides, Herbicides and Polychlorinated Biphenyls Comparison of Target Analytes From Resource Conservation and Recovery Act Appendix IX Ground Water Monitoring List and U.S. Environmental Protection Agency Contract Laboratory Program Target Compound List

RFA/SV Workplan, Group III
U.S. Naval Station Mayport
Mayport, Florida

Pesticides, Herbicides and Polychlorinated Biphenyls	Appendix IX	CLP TCL	Currently A Target Analyte	Detected at NAVSTA Mayport
Organochlorine Pesticides				
alpha-Benzene hexachloride (BHC)	✓	✓	✓	✓
beta-BHC	✓	✓	✓	✓
delta-BHC	✓	✓	✓	✓
gamma-BHC (Lindane)	✓	✓	✓	
Heptachlor	✓	✓	✓	✓
Aldrin	✓	✓	✓	
Heptachlor epoxide	✓	✓	✓	✓
Endosulfan I	✓	✓	✓	
Dieldrin	✓	✓	✓	
4,4'-Dichlorodiphenyldichloroethylene (4,4'-DDE)	✓	✓	✓	✓
Endrin	✓	✓	✓	
Endosulfan II	✓	✓	✓	
4,4'-Dichlorodiphenyldichloroethane (4-4'-DDD)	✓	✓	✓	✓
Endosulfan sulfate	✓	✓	✓	
4,4'-Dichlorodiphenyltrichloroethane (4,4'-DDT)	✓	✓	✓	✓
Methoxychlor	✓	✓	✓	
Endrin keytone		✓	✓	
Endrin aldehyde	✓	✓	✓	
alpha-Chlordane	✓	✓	✓	✓
gamma-Chlordane	✓	✓	✓	✓
Toxaphene	✓	✓	✓	
Organophosphorus Pesticides				
Aspon-SS	✓		*	
Triethylphosphorothioate	✓		*	
Thionazin	✓		*	
Parathion methyl	✓		*	
Phorate	✓		*	
Disulfoton	✓		*	
Sulfotepp	✓		*	
Famphur	✓		*	
Parathion ethyl	✓		*	
Dimethoate				
See notes at end of table.				

Table 4-3 (Continued)
Gas Chromatograph Pesticides, Herbicides and Polychlorinated Biphenyls Comparison of Target Analytes From Resource Conservation and Recovery Act Appendix IX Ground Water Monitoring List and U.S. Environmental Protection Agency Contract Laboratory Program Target Compound List

RFA/SV Workplan, Group III
U.S. Naval Station Mayport
Mayport, Florida

Pesticides, Herbicides and Polychlorinated Biphenyls	Appendix IX		Currently A Target Analyte	Detected at NAVSTA Mayport
Chlorinated Herbicides				
2,4-Dichlorophenylacetic acid			★	
3,5-Dichlorobenzoic acid			★	
Dinoseb	✓		★	
(2,4,5-Trichlorophenoxy)-acetic acid (2,4,5-T)	✓		★	
α-(2,4,5-Trichlorophenoxy) propionic acid (2,4,5-TP) (Silvex)	✓		★	
2,4-Dichlorophenoxyacid (2,4-D)			★	
Polychlorinated Biphenyls (PCBs)				
Aroclor-1016	✓	✓	✓	
Aroclor-1221	✓	✓	✓	
Aroclor-1232	✓	✓	✓	
Aroclor-1242	✓	✓	✓	
Aroclor-1248	✓	✓	✓	✓
Aroclor-1254	✓	✓	✓	
Aroclor-1260	✓	✓	✓	✓

Notes: ✓ = Target analytes for environmental and quality control samples collected at each Solid Waste Management Unit.

★ = Target analytes for environmental and quality control samples collected at pesticide handling and storage sites.

Appendix IX = 40 Code of Federal Regulations Part 264, Appendix IX, Ground Water Monitoring List. Analytical Methodology for Appendix IX is Test Methods for Evaluation of Solid Wastes, US EPA, SW 846, Third Edition, November, 1986. (And Proposed Update Package, 1989.)

CLP TCL = U.S. Environmental Protection Agency Contract Laboratory Program, Statement of Work for Organic Analysis, Multi-Media, Multi-Concentration, Exhibit C, Target Compound List and Contract Required Quantitation Limits, OLM01.0, July 1993.

Table 4-4
Inorganics and Cyanide
Comparison of Target Analytes From Resource Conservation and Recovery Act Appendix IX Ground Water Monitoring List and U.S. Environmental Protection Agency Contract Laboratory Program Target Analyte List

RFA/SV Workplan, Group III
U.S. Naval Station Mayport
Mayport, Florida

Inorganics and Cyanide	Appendix IX	CLP TCL	Currently A Target Analyte	Detected at NAVSTA Mayport
Aluminum		✓		
Antimony	✓	✓	✓	✓
Arsenic	✓	✓	✓	✓
Barium	✓	✓	✓	✓
Beryllium	✓	✓	✓	✓
Cadmium	✓	✓	✓	✓
Calcium		✓	✓	✓
Chromium	✓	✓	✓	✓
Cobalt	✓	✓	✓	✓
Copper	✓	✓	✓	✓
Iron		✓	✓	✓
Lead	✓	✓	✓	✓
Magnesium		✓	✓	✓
Manganese		✓	✓	✓
Mercury	✓	✓	✓	✓
Nickel	✓	✓	✓	✓
Potassium		✓	✓	✓
Selenium	✓	✓	✓	✓
Silver	✓	✓	✓	✓
Sodium		✓	✓	✓
Thallium	✓	✓	✓	✓
Tin	✓		✓	✓
Vanadium	✓	✓	✓	✓
Zinc	✓	✓	✓	✓
Cyanide	✓	✓	✓	✓

Notes: ✓ = Target analytes for environmental and quality control samples collected at each Solid Waste Management Unit.

Appendix IX = 40 Code of Federal Regulations Part 264, Appendix IX, Ground Water Monitoring List. Analytical Methodology for Appendix IX is Test Methods for Evaluation of Solid Wastes, US EPA, SW 846, Third Edition, November, 1986. (And Proposed Update Package, 1989.)

CLP TAL = U.S. Environmental Protection Agency Contract Laboratory Program, Statement of Work for Inorganic Analysis, Multi-Media, Multi-Concentration, Target Analyte List and Contract Required Quantitation Limits, ILMO1.0, March 1990.

5.0 PRELIMINARY RISK SCREENING

A human health risk screening will be conducted for the Group III RFA/SV SWMUs at NAVSTA Mayport to support either additional actions, including risk-based closure, or no further action (NFA) decisions. The risk assessment will be conducted according to the appropriate Federal and State guidelines including:

- Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part A (USEPA, 1989b);
- Supplemental Region IV Risk Assessment Guidance (USEPA, 1993); and
- RCRA Facility Investigation Guidance (USEPA, 1989a).

The risk assessment will be conducted in five parts:

- data evaluation and summarization,
- identification of contaminants of potential concern (CPCs),
- identification of present and future potential exposures at Group III RFA/SV SWMUs,
- toxicity assessment of the CPCs,
- risk characterization, and
- an uncertainty analysis.

5.1 DATA EVALUATION AND SUMMARIZATION. All validated data will be gathered and entered into a database and reviewed for completeness and conformation with the data quality objectives (DQOs) for a baseline risk assessment (USEPA, 1992). The analytical methods used and quantitation limits of all samples will be reviewed for appropriateness for a risk assessment. Environmental samples with elevated quantitation limits or rejected results will be identified and their significance to the risk assessment will be evaluated. Chemicals that are not detected at least once in a medium will be eliminated from the risk assessment.

A comparison of sample concentrations with background concentrations will be conducted to identify naturally occurring inorganic chemicals or anthropogenic contaminants at the site. In accordance with USEPA Region IV guidance (USEPA, 1993), chemicals detected at concentrations less than twice the arithmetic mean of representative background samples will be considered as natural or of anthropogenic origin and may not be used in the human health risk assessment.

5.2 IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN. If the number of chemicals in the data set is relatively large, a screening process may be implemented to identify the chemicals potentially posing the greatest health risk. A set of screening concentrations (SCs) based on either a cancer risk of $1x10^{-6}$ or a non-cancer Hazard Quotient (HQ) of 0.1 will be developed for chemicals detected in each medium. The SCs will be based on a potential residential exposure and the derivation method will be documented in the risk assessment. Applicable or relevant and appropriate requirements (ARARs) for chemicals present at the site will also be identified.

Maximum concentrations of chemicals detected in each medium will be compared with the SCs and/or ARARs. Those chemicals detected in each medium above SCs or ARARs will be considered CPCs and will be evaluated through the remainder of the risk assessment. Chemicals detected at levels below SCs or ARARs will generally be dropped from the risk assessment unless, in the professional judgment of the risk assessor, they could present a human health risk disproportionate to the concentrations of the chemicals detected. Factors that could result in retention of a chemical as a CPC include USEPA carcinogenic weight of evidence classification, mobility, persistence, or bioaccumulation.

<u>5.3 EXPOSURE ASSESSMENT</u>. In the exposure assessment, the types and magnitudes of potential human exposures to CPCs will be estimated in a four-step process that includes:

- characterization of the exposure setting,
- identification of exposure pathways,
- quantification of exposures, and
- construction of exposure scenarios.

In characterizing the exposure setting, the risk assessor will evaluate both the physical characteristics of the site and the nature of surrounding populations to provide a basis for assessing potential exposures. Important site characteristics that may influence human contact with site contaminants include surface conditions, soil type, degree of vegetative cover, and conditions that may affect the migration of contaminants such as speed and direction of groundwater flow.

Population characteristics to be evaluated include the location of current populations relative to the site, and usual activities of these populations. The presence of potentially sensitive subpopulations, such as children and elderly or infirm persons, will also be considered.

The risk assessor will use information gained in the exposure setting to identify potential exposure pathways. A completed exposure pathway describes the specific way that a human receptor comes into contact with site contaminants. A completed pathway links the source of contamination, a potential exposure point and/or migratory pathway, and the location and activities of human receptors.

To quantify contaminant exposures in the identified human receptors, exposure point concentrations for each contaminant are calculated as are contaminant intakes for each completed exposure pathway, in accordance with USEPA Region IV guidance (USEPA, 1989b; 1993). The exposure point concentration for a contaminant in a medium will be the lower of either the maximum detected concentration at the site or the 95 percent upper confidence limit (UCL) of the estimated mean, as calculated by the equation:

$$UCL = e^{\left(\bar{x} + 0.5s^2 + \frac{s \times H}{\sqrt{n - 1}}\right)} \qquad (1)$$

where

UCL = 95 percent upper confidence level of the estimated mean,
e = 2.71828,
$\bar{x}$ = arithmetic mean of log-transformed data,
s = standard deviation of log-transformed data,
H = statistic from Gilbert (1987), and
n = number of samples.

Except for groundwater results, one-half the sample quantitation limit will be used as a surrogate value in the determination of the 95 percent UCL at sample points at which a chemical was not detected. USEPA Region IV policy is to determine groundwater 95 percent UCLs based only on results taken within the contaminant plume and negative results will not be used in determining groundwater 95 percent UCLs (USEPA, 1993).

Exposure point concentrations for some exposure pathways may use the results from modeling rather than from field samples. Exposures to contaminants volatilizing from water used for lawn irrigation and indoor showers will be modeled as will potential soil exposures at the land surface.

Once the exposure point concentration for each contaminant has been selected, intakes via each exposure pathway for all identified human receptors will be calculated using standard USEPA methodology (USEPA, 1989b). Intakes for receptors will be based on the age and weight of the receptor, intake or contact rate, exposure frequency, exposure duration, and averaging time. The Average Daily Dose (ADD) will be used in the characterization of non-cancer risks. The Lifetime Average Daily Dose (LADD) will be used in the cancer risk characterization.

The final step in the exposure assessment will be the construction of exposure scenarios. Each exposure scenario will be based on an identified or projected population of human receptors. For identified human receptors, contaminant intakes for selected exposure pathways over relevant exposure periods may be grouped for analysis. For example, one scenario will address potential exposures of a child trespasser playing on the SWMU. In addition to currently existing scenarios, scenarios for potential future land uses at the site will be developed. One of these scenarios will be residential use of the land, assuming the presence of children and long-term residents on the site.

<u>5.4 TOXICITY ASSESSMENT</u>. The toxicity assessment summarizes available information on the potential toxic effects of the CPCs and provides an estimate of the relationship of dose to the likelihood or severity of adverse human health effects. The USEPA has gathered and analyzed toxicity information for the majority of chemicals expected at NAVSTA Mayport. Weight of evidence classifications and numerical toxicity factors have been developed and subjected to extensive peer review. This toxicity information is made available in several sources including:

- Integrated Risk Information System (IRIS),

- Health Effects Assessment Summary Tables (HEAST), and

- Agency for Toxic Substances and Disease Registry (ATSDR) toxicology profiles.

If no information is available about a specific chemical in these sources, the risk assessor will consult with USEPA Region IV and FDEP risk assessment staff to determine appropriate toxicity values.

The risk assessor will identify the exposure periods for which non-cancer toxicity information is required from the results of the exposure assessment. Current reference doses (RfDs) for all CPCs will be obtained from IRIS, the HEAST, or USEPA Region IV. Chronic RfDs values will be collected for use in long-term and child exposures. For shorter exposures, such as workers or adult trespassers, subchronic RfDs and 1- and 10-day health advisories may be used as toxicity values if the risk assessor determines their use is appropriate. If necessary, the risk assessor may develop RfDs for some chemicals, especially tentatively identified compounds (TICs). Any toxicity values developed will be made available to USEPA Region IV and FDEP risk assessment staff for review and will be used in the risk assessment only with prior approval of USEPA Region IV and FDEP.

In addition to the current RfD values, the risk assessment will include other information relevant to interpreting the significance of potential health risks. The critical study on which the RfD is based will be described as will the critical effect in the study, any uncertainty and modifying factors applied to the development of the RfD, and the degree of confidence assigned to the RfD.

Toxicity factors for carcinogenic chemicals will include current slope factors and weight of evidence classifications for all carcinogens. For confirmed human carcinogens (USEPA Class A), the cancer type observed in exposed humans will also be identified.

Route-to-route extrapolations, especially for dermal exposures, and absorption adjustments to toxicity values will be made by the risk assessor as necessary and will be consistent with good professional judgment.

<u>5.5 RISK CHARACTERIZATION</u>. The risk characterization combines the results of the exposure and toxicity assessments in quantitative expressions of potential health risks associated with chemical exposure. The first step in the risk characterization will be to collect the results of these assessments and conduct a final "reality check" to make sure that the results will be reasonable and representative of potential risk levels. Exposure point concentrations, absorption adjustments, exposure factors, and durations will be checked for correctness.

In the second step of the risk characterization, cancer risks and non-cancer HQs will be calculated for each CPC in each identified exposure pathway. For each exposure pathway, cancer risks from each chemical will be summed to estimate pathway-specific cancer risk, and non-cancer HQs will be summed to estimate a pathway-specific Hazard Index (HI).

The third step of risk characterization will consist of combining pathway-specific cancer risks and HIs for each scenario. Each scenario will be described with a specific statement indicating whether the scenario represents:

- an exposure known to be occurring under current conditions,

- an exposure possibly occurring under current conditions, or

- an exposure not believed to be occurring under present conditions, but possible in the future if site conditions change.

For each scenario, the selected pathway-specific risks will be summed to estimate total cancer risk. Similarly, pathway-specific HIs will be summed to estimate the Total Hazard Index (THI). If the calculated THI for a scenario is equal to or higher than 1.0, the risk assessor will review the critical studies for each CPC to determine whether combination of the HQs is appropriate. The risk assessor may segregate the HQs of individual chemicals into group HIs based on sites of toxicity. If the THI for a scenario is less than 1.0, the segregation of the HQs will not be undertaken.

The risk characterization will also contain an analysis of the uncertainties associated with the risk assessment process. Uncertainties, which will be addressed, arise from several sources:

- uncertainties in the representativeness of analytical data for actual chemicals and concentrations at the site,

- uncertainties in modeling results used to determine exposure point concentrations,

- uncertainties in exposure factors used to calculate intakes,

- uncertainties in the appropriateness of toxicity values, and

- potential for synergistic or antagonistic interaction of CPCs.

The results of the risk assessment will be used to develop recommendations for the Group III RFA/SV SWMUs at NAVSTA Mayport. These recommendations may include NFA, RFI investigations, or remediation of isolated hotspots of contamination in otherwise uncontaminated areas.

6.0 QUALITY ASSURANCE AND QUALITY CONTROL

QA/QC standards and procedures will comply with the approved QAPP and Site-Specific Quality Assurance Plan (QAP) contained in Appendices A and B, respectively, of the RFI workplan, Volume II (ABB-ES, 1991). QC samples will be collected in accordance with Chapter 11.0 of the QAPP. Decontamination of field sampling equipment will be in accordance with Section 6.3 of the QAPP and the Technical Memorandum, *Decontamination Procedures*, located in Appendix D of this RFA/SV workplan. Sample handling and project documentation will be in accordance with Section 3.1 of the RFI workplan, Volume II, and the referenced sections of the QAPP. Laboratory QA/QC will be in accordance with the laboratory QAPP located in Appendix C of the RFI workplan, Volume II.

7.0 HEALTH AND SAFETY

Health and safety requirements will be in accordance with the general Health and Safety Plan located in Volume III of the RFI workplan (ABB-ES, 1991), and the site-specific Health and Safety Plan located in Appendix E of this RFA/SV workplan.

8.0 SCHEDULE

The schedule for completion of RFA/SV activities at Group III SWMUs is presented in the Interim Final Corrective Action Management Plan for NAVSTA Mayport, May 1994. The schedule assumes ready access to all sites and no delays due to the securing of required permits. The schedule may also be modified by the nature and extent of regulatory review cycles and new data collected during the RFI.

REFERENCES

ABB Environmental Services, Inc., 1991, Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Workplan, Volumes I, II, and III (Interim Final): prepared for Southern Division, Naval Facilities Engineering Command, October.

ABB-ES, 1992, Contamination Assessment Report, Alpha-Delta Pier, Naval Station, Mayport, Florida: prepared for Southern Division, Naval Facilities Engineering Command, November.

ABB-ES, 1993a, Contamination Assessment Report Addendum, Alpha-Delta Pier, Naval Station, Mayport, Florida: prepared for Southern Division, Naval Facilities Engineering Command, March.

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A.T. Kearney, Inc., 1989, RCRA Facility Assessment of the Naval Station Mayport, Jacksonville, Florida (Draft): prepared for U.S. Environmental Protection Agency (USEPA), September.

Environmental Science and Engineering, Inc. (ESE), 1986, Initial Assessment Study, Naval Station Mayport, Florida: prepared for Naval Energy and Environmental Support Activity, U.S. Navy, May.

Gilbert, R.O., 1987, Statistical Methods for Environmental Pollution Monitoring: Van Nostrand Reinhold Company, New York.

U.S. Army Corps of Engineers (USACE), Contamination Assessment Report, Mayport Naval Station, Building 1490, SIMA Shop (Draft): prepared for U.S. Navy, Southern Division, Naval Facilities Engineering Command, Charleston, South Carolina, May.

USACE, 1993, Addendum 1 to Contamination Assessment Report, Mayport Naval Station Building 1490, SIMA Shop, Mayport, Florida: prepared for U.S. Navy, Southern Division, Naval Facilities Engineering Command, Charleston, South Carolina, September.

U.S. Environmental Protection Agency (USEPA), 1983, Methods for Chemical Analysis of Water and Wastes, USEPA, PB 84-128677, March.

USEPA, 1986, Test Methods for Evaluation of Solid Wastes, USEPA, SW 846, Third Edition, November 1986 (and proposed update package, 1989); and Code of Federal Regulations (CFR) Title 40 Part 264, Appendix IX.

REFERENCES (Continued)

USEPA, 1988, HSWA Permit No. FL9-170-024-260: Region IV, March 25, 1988, revised June 15, 1993.

USEPA, 1989a, Interim final RCRA facility investigation guidance, four volumes: Waste Management Division, Office of Solid Waste, EPA 530/SW-89-031, May.

USEPA, 1989b, Risk Assessment Guidance for Superfund: Volume I Human Health Evaluation Manual (Part A), Interim Final: Office of Emergency and Remedial Response, EPA/540/1-89/002.

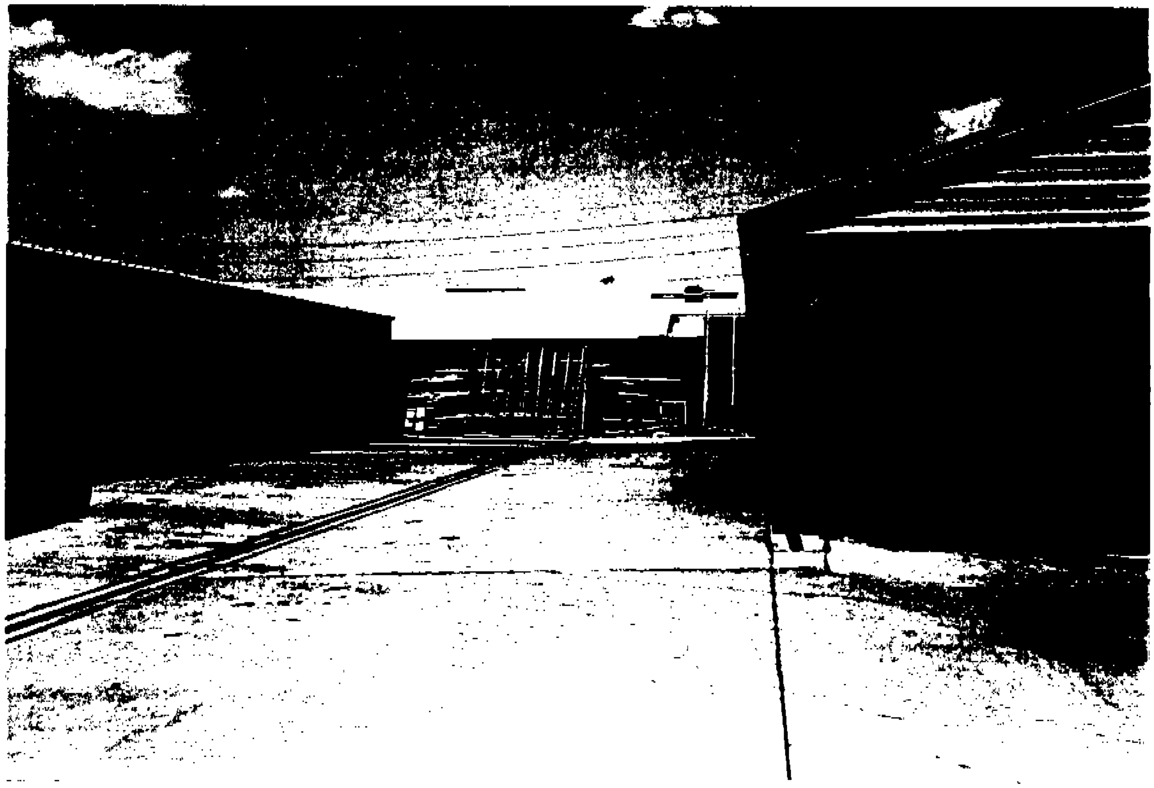
USEPA, 1991, Letter from USEPA (Mr. James H. Scarbrough, P.E., Chief RCRA and Federal Facilities Branch, Waste Management Division) to Commanding Officer, Naval Station Mayport (Captain Mitchell) regarding Interim Final RFI Workplan and Corrective Action Management Plan: October 24.

USEPA, 1992, Guidance for Data Useability in Risk Assessments (Part A): Office of Emergency and Remedial Response, Washington, D.C. 9285.7-09A, April.

USEPA, 1993, Supplemental Region IV Risk Assessment Guidance: USEPA Region IV Atlanta, Georgia, October.

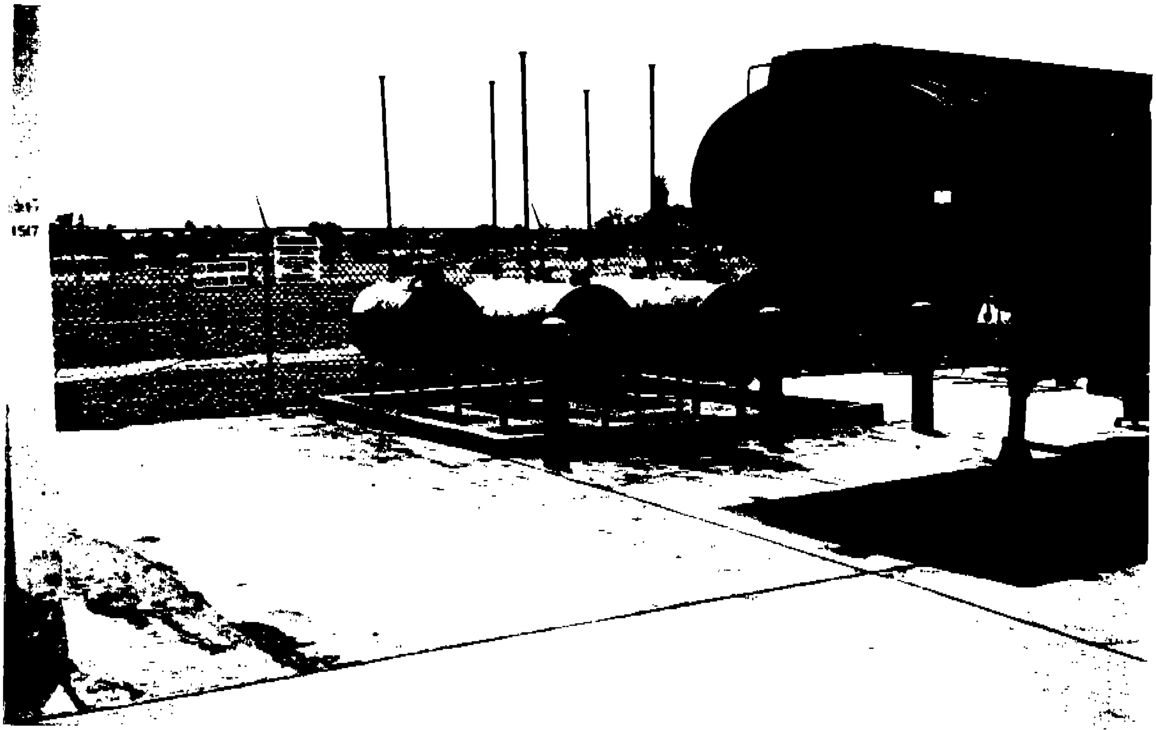
APPENDIX A

PHOTOGRAPHS

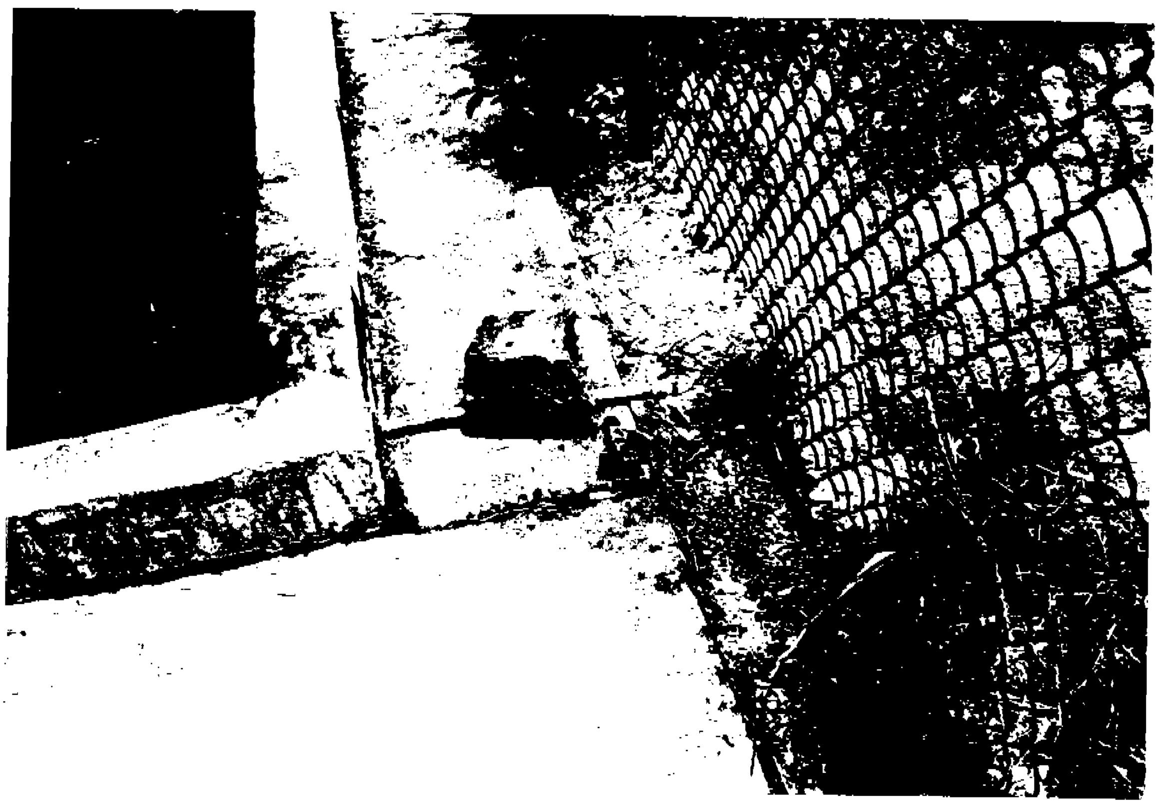


SWMU 20, Hobby Shop Drain - View looking north of the south side of the west wing of Building 414. Building 1277A is on the left. A trough drain (stormwater drainage) is located between Buildings 1277A and 414.

SWMU 20, Hobby Shop Drain - View looking east at south end of Building 1277a. The wash oil storage area is to the west of the east side of Building 1817 at the top right of the picture.



SWMU 20, Hobby Shop Drain - View looking south of current waste oil storage area, located in the south central portion of the Hobby Shop.

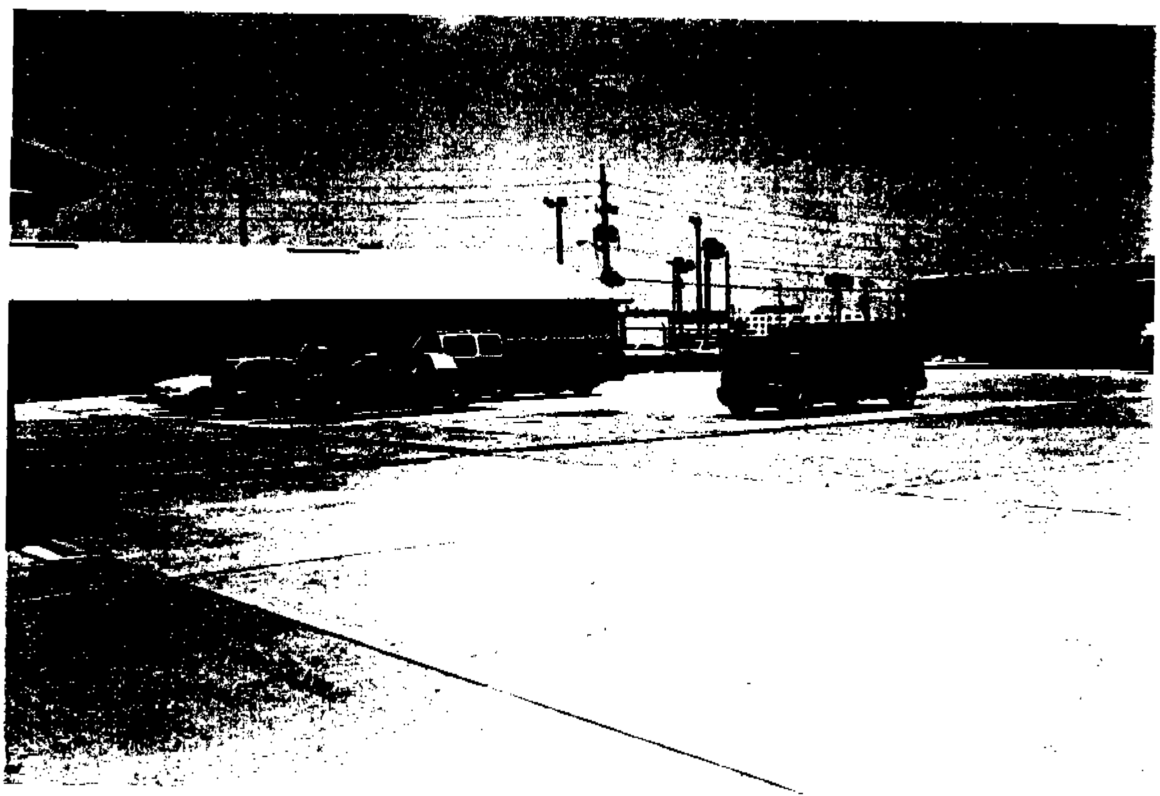


SWMU 20, Hobby Shop Drain - View looking east of the drain pipe at the southwest corner of the waste oil storage containment structure.

SWMU 20, Hobby Shop Drain - View looking north of the oil/water separator located at the northwest portion of the Hobby Shop site. SIMA is the building on the northwest.

SWMU 20, Hobby Shop Drain - View looking northeast of oil/water separator.

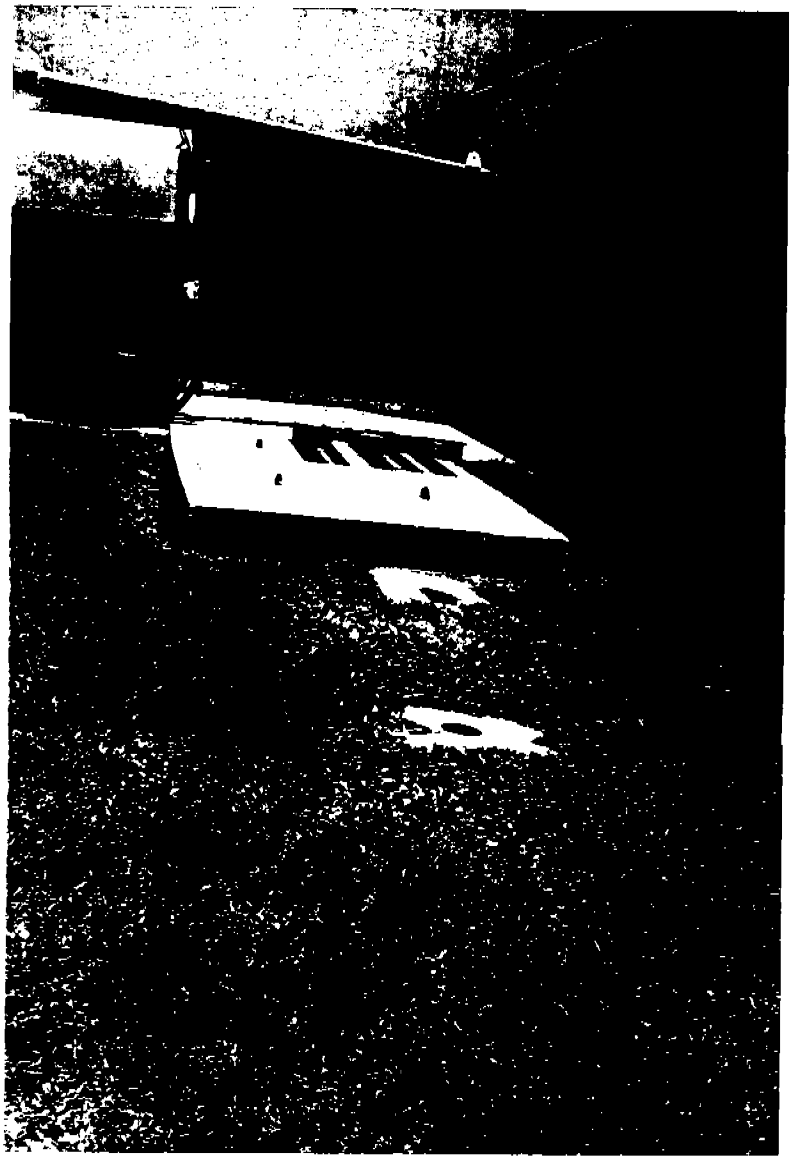
SWMU 21, Hobby Shop Scrap Storage Area - View looking north at eastern wing of Building 414. Former Hobby Shop Scrap Storage Area was located near the top right corner of Building 414.



SWMU 21, Hobby Shop Scrap Storage Area - View looking northeast of east wing of Building 414. Existing scrap storage area is dumpster located between parked cars and the southeast portion of Building 414.

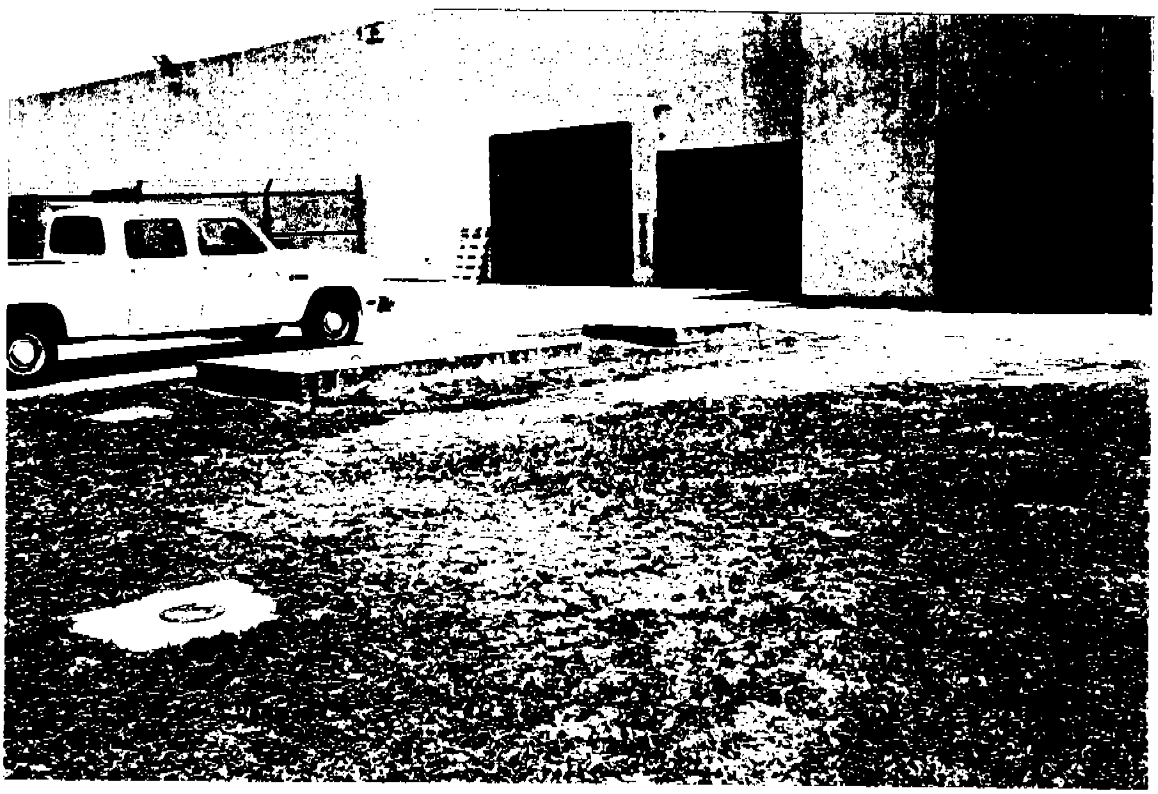
SWMU 46, SIMA Engine Drain Sump - View of Engine Drain Sump in Building 1488, SIMA.

SWMU 46, SIMA Engine Drain Shop - View toward the south from the northwest side of Building 1488. The northernmost oil/water interceptor is in the bottom left of the picture.

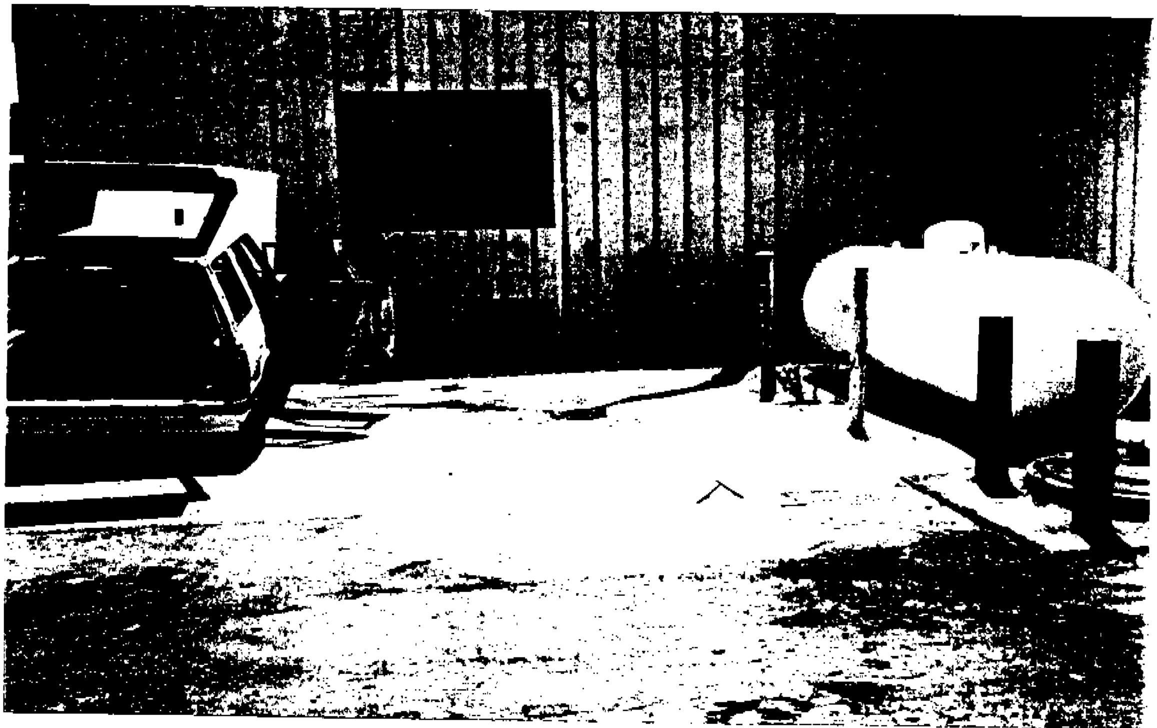


SWMU 46, SIMA Engine Drain Sump - View looking east at northwest side of Building 1488. The northernmost oil/water interceptor is beneath the concrete slab.

SWMU 46, SIMA Engine Drain Sump - View looking north towards the northwest corner of Building 1488. The 1,000-gallon capacity holding tank is located beneath concrete slab with the steel "I" beam.



SWMU 46, SIMA Engine Drain Sump - View looking east at the southernmost oil/water interceptor at the southwest portion of Building 1488.



SWMU 52, PDW Service Station Storage Area - Northeast corner of Building 25, view to southwest. Drain is located to the west of the automobile in the concrete pad.

SWMU 52, PWD Service Station Area - Northwest corner of Building 25, view to southwest. Waste oil bowser (red container) is located to the left side of the car.

APPENDIX B

REMEDIAL ACTION PLAN
ALPHA DELTA PIERS, NAVSTA MAYPORT

REMEDIAL ACTION PLAN

ALPHA DELTA PIERS
NAVAL STATION MAYPORT
MAYPORT, FLORIDA

Unit Identification Code (UIC) No. N65928

Contract No. N62467-89-D-0317

Prepared by:

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Bryan Kizer, Code 184PDC, Engineer-in-Charge

December 1993

REMEDIAL ACTION PLAN REVIEW CHECKLIST
Bureau of Waste Cleanup
FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

Facility Name: Alpha Delta Pier ______ Reimbursement Site: [ ]

Location: Naval Station, Mayport ______ State Contract Site: [ ]

FAC ID# ______ EDI #: ______ Enforcement Case: [ ]

Reviewer: ______ Date: ______ Consultant: ABB Environmental Services, Inc.

Date of QAPP Approval: ______

Date of CAR Approval: ______

Page(s) I. General

8-1 (1) RAP signed, sealed, and dated by Florida P.E. (per FS 471.025) YES

____ (2) remediation by State cleanup program is proposed (yes/no) NO

2-7 (3) summary of CAR conclusions and results included in RAP YES

____ (4) sampling results within six months Latest sampling event: May 1993 (after CAR approval)

____ (5) underground storage tanks and product lines have tested tight no UST's, pipes tested tight

____ (6) method of potable water supply to area indicated NS Mayport potable water system

____ (7) underground utilities which may enhance contaminant transport shown YES - Figures 2-4 and 2-5

____ (8) estimated time of cleanup provided YES (see calculations in Appendix B)

APP. B (9) fencing treatment area considered YES - hazardous materials storage building

____ (10) discussion of proposed equipment maintenance provided YES - sections 4.4, 4.5, 4.6, and 7.0

____ (11) all local, State, and Federal permits obtained and conditions stated in RAP YES

____ (12) cost estimate for project with breakdown of capital and O&M costs provided YES - section 5.0

____ (13) feasibility of leasing equipment considered (cost cannot exceed purchase price) N/A

____ (14) cost effective analysis provided if design is innovative system selection discussed in section 3.0

7-1 (15) statement that signed and sealed as-built (record) drawings to be provided YES

II. Free Product Removal

____ (1) description of free product recovery system provided YES - section 4.3

____ (2) disposition of recovered free product discussed YES - section 4.3

NA (3) automated product pump shutdown for high level in product tank NA

NA (4) oil/water separator calculation provided (e.g., detention time) NA

III. Soil Remediation - General

NA (1) Hazardous soils (e.g., ignitable, corrosive, reactive, toxic, or petroleum refining waste) to be disposed of properly No Hazardous Soils Anticipated

NA (2) Excessively contaminated soils (per soil guidance manual) to be remediated ______

NA (3) Effect of soil leachate from non-excessively contaminated soils (e.g., 10-500 ppm/OVA) upon groundwater contaminant levels evaluated ______

NA (4) Disposition of excavated, contaminated soils discussed NA - Excavation is not proposed.

NA (5) Volume of all contaminated soils estimated ______

____ (6) Rationale for 'no action' alternative for soil remediation provided See section 3.0

IV. Landfarming of Soil

__NA__ (1) Must have total recoverable hydrocarbon concentrations in soil less than 500 mg/kg by EPA Draft Method 9073. NA

__NA__ (2) Adequate surface area available (______sf) to spread soil 6" to 1' thick NA

__NA__ (3) Location of landfarming operation if different from facility location NA

__NA__ (4) Landfarming area is flat (less than 5% slope) NA

__NA__ (5) Impermeable base provided. Type: NA

__NA__ (6) Surface water runoff controls provided NA

__NA__ (7) Groundwater monitoring plan proposed NA

__NA__ (8) Frequency of tilling provided NA

__NA__ (9) Frequency of nutrient application provided (if proposed) NA

__NA__ (10) Soil sampling frequency and sampling methods provided NA

__NA__ (11) Underlying soil and groundwater monitoring procedures provided and acceptable NA

__NA__ (12) Landfarming will be continued until the TRPH concentration is 10 ppm or less (by EPA Draft Method 9073) and the BTEX concentration is less than 100 ppb (by EPA Method 5030/8020); or TRPH concentration is 50 ppm or less, and PAH concentration is 6 ppm or less, and VOH concentration is 50 ppb or less. NA

__NA__ (13) Impact of air emission considered NA

V. Landfilling of Soils

__NA__ (1) Landfill lined NA

__NA__ (2) Name and location of landfill provided along with conditions of acceptance NA

VI. Thermal Treatment

__NA__ (1) Name and location of thermal treatment facility provided NA

__NA__ (2) Facility is permitted for thermal treatment of contaminated soils NA

__NA__ (3) Influent and effluent sampling frequency and analytical methods are appropriate NA

__NA__ (4) Thermal treatment will reduce TRPH in the soil to 10 ppm by EPA draft Method 9073 or less, and the BTEX concentration to less than 100 ppb by EPA Method 5030/8020 (see IV.(12)) NA

VII. Soil Vacuum Extraction

__NA__ (1) Location of extraction and monitoring well(s) provided along with construction details ________

__NA__ (2) On-site pilot system (field testing of system with vacuum piezometers) or modeling required unless pilot study would be similar in scale to proposed treatment system ________

__NA__ (3) Air phase treatment equipment description to be provided during the first two months of system operation ________

__NA__ (4) Vacuum pump description, flowrate (_____cfm), and operating vacuum (_____in Hg) provided ________

__NA__ (5) Surface sealing provided for vacuum extraction (yes/no) ________

__NA__ (6) Explosion-proof vacuum pump provided ________

__NA__ (7) Vacuum gauge provided ________

__NA__ (8) Knock out/condensation trap provided ________

__NA__ (9) system monitoring proposal provided ________

__NA__ a) air emission to be sampled and analyzed monthly per Department guidance ________

__NA__ b) soil cleanup criteria provided ________

VIII. Groundwater Extraction

NA (1) Feasibility of using existing on-site wells for groundwater extraction considered ______

NA (2) Recovery well or trench location(s) and construction details included ______

NA (3) Screening interval appropriate ______

NA (4) Predicted horizontal and vertical area of influence with hydraulic gradient provided ______

NA (5) Expected drawdown in recovery well or trench (____ft) ______

NA (6) Has multiple well configuration been considered to minimize drawdown and product adsorption onto the soils in the cone of depression ______

NA (7) groundwater pump(s) description, pump characteristic curve, design flowrate (____ gpm at ______ ft TDH) provided ______

a) hydraulic design (including friction losses and suction lift requirements) acceptable.

NA (8) pneumatic or peristaltic pump considered if design flow is less than 5 gpm ______

a) If used, performance specifications provided ______

NA (9) automated well level controls provided for shutting down groundwater pump(s) ______

NA (10) totalizing flowmeter installed on influent line from every groundwater recovery pump ______

NA (11) check valve provided on pump discharge piping if not integral to pump ______

NA (12) shutoff/throttling valve provided on pump discharge piping ______

IX. Groundwater Treatment System - General

NA (1) expected or calculated influent concentrations acceptable (based upon pumping test dynamic sample, weighted averaging procedure, or other reasonable assumptions) in situ treatment proposed

NA (2) feasibility of discharge to sewage treatment plant evaluated ______

NA a) consideration given to less time and/or level of treatment required to meet sewage system's pretreatment standards ______

______ (3) site piping plan, and schematics of all treatment components, piping, valves, controls and appurtenances provided Site layout and treatment system drawings provided in Figures 4-1, 4-4, B-1, and B-6

Fig 4-4 a) influent and effluent sampling ports provided YES

______ b) piping type and size provided YES - refer to Appendix B

NA (4) iron level in groundwater provided (_____mg/l) from representative dynamic or static sample(s) and pretreatment for iron removal considered in situ treatment proposed, iron considered in bench tests

NA (5) pretreatment or O&M for biofouling provided NA

______ (6) adequate remediation proposed for other contaminants (e.g., MTBE, PAHs, EDB,1-2 dichloroethane) YES

X. Air Stripping Treatment Process

(1)Packed Tower

NA a) type, size, and surface area of packing provided ______

NA b) calculations, criteria (tower height, diameter, packing height, air flowrate, blower horsepower)/design parameters provided ______

NA c) method/procedure for determining K_La or HTU given ______

NA d) pressure gauge provided to indicate the effects of fouling over time ______

NA e) mist eliminator provided ______

NA f) observation port provided ______

(2)Diffused Aerator

NA a) calculation, criteria, (contact time, air flowrate, pressure drop, calculated efficiency) and design assumptions provided NA

(3) General

NA a) maximum ambient air impact calculations provided NA

NA b) equipment description provided if emissions treatment necessary

NA c) automated recovery well shutdown when blower failure occurs

NA d) daily analysis screening with portable GC, or other appropriate measures, during system startup until system consistently meets discharge criteria

XI. Carbon Adsorption Process

NA (1) carbon specification provided

NA (2) carbon unit(s) sizing calculations (carbon usage rate*, contact time*, pressure losses)/design assumptions provided NA

NA (3) isotherm data from pilot study needed if carbon adsorption used as primary treatment and total VOA concentrations are appreciable (VOA > 100 ppb typically) in order to estimate carbon capacity required and sampling frequency NA

NA (4) TOC in groundwater determined and effect on treatment process considered

NA *(5) sand filter or cartridge unit considered prior to carbon unit

NA *(6) pressure gauge and pressure release valve provided on carbon (and sand) filter NA

NA *(7) carbon disposal and replacement method discussed

NA *(8) two carbon units in series considered to allow for maximum carbon utilization and to prevent breakthrough of contaminant in system effluent

NA (9) automated recovery well shutdown if primary carbon unit pressure too high

NA *(10) schedule for sampling between carbon adsorption units provided

* only item required for polishing carbon units

XII. Lead Removal

(1) lead concentrations; unfiltered (___ppb), background (___ppb), and if unfiltered > 50 ppb, filtered (ppb) Latest sampling event detected lead at 35 ppb (filtered), less than the 50 ppb maximum for G-III

NA (2) discussion of area of lead contamination provided NA

NA (3) if unfiltered sample greater than 50 ppb and filtered sample less than 50 ppb, lead removal filtration system proposed NA

NA (4) method of lead removal with pertinent design calculation provided NA

XIII. In Situ/Enhanced Bioreclamation

(1) groundwater parameters determined (pH, DO, TDS, N, P, Temp, TOC, and Alk, etc.) YES

(2) monitoring program discussed. TOC to be monitored See section 4.6

(3) additional oxygen source provided YES - see section 4.2 and Appendix B

(4) oxygen and nutrients adequately applied to contaminated area YES - see Appendix B

(5) suitable soils present (non-clayey, good transport, low adsorption properties) YES

(6) bench scale and/or in situ pilot study proposal provided Bench tests completed, monitor at start-up

XIV. Infiltration Gallery

NA (1) field percolation test (preferably with double ring infiltrometer) provided if gallery base is located in the vadose zone

NA (2) infiltration gallery construction details and location provided

NA (3) gallery calculation/assumptions provided with mounding analysis

NA (4) piezometer and cleanout pipe provided in gallery

NA (5) geotextile filter fabric to be installed around and above gallery

NA (6) discussion or modeling of gallery's effect on plume migration provided

XV. Injection Well

NA (1) injection well location and proposed construction details provided NA

NA (2) screening interval appropriate NA

(3) effluent discharge pump description, pump characteristic curve, and design flowrate(____gpm at _ _ ft TDH) provided NA

NA (4) carbon polishing unit provided NA

NA (5) air release valve provided on highest point of effluent discharge piping NA

NA (6) injection rate (well hydraulics) calculations provided NA

NA (7) UIC permit conditions met NA

NA (8) injections well's effect on potable wells and plume migration provided NA

XVI. Alternative Disposal Methods

(1)for surface water discharge

NA a) conditions of NPDES general permit no. FLG040001 met

NA b) after RAP approval, NPDES notice of intent to be submitted to EPA

NA (2) if applicable, consumptive use permit obtained from water management district NA

NA (3) approval from municipality for sewer discharge and alternate cleanup levels with conditions provided NA

NA (4) applicable permits obtained for stormwater discharge

XVII. Sampling Requirements

(1) designated monitoring wells chosen and sampling frequency adequate (recommend monthly for asymptotic curve determination and quarterly otherwise) YES - see section 4.6

NA (2) weekly sampling of influent from recovery well(s) and effluent at treatment system for first month, monthly sampling for first year acknowledged See section 4.6

(3) filing of annual status reports acknowledged YES - section4.6

(4) water table contours and depth and extent of free product to be determined at monthly or quarterly sampling event YES - see sections 4.3 and 4.6

(5) sampling program includes appropriate contaminants/procedures as specified in 17-770.008 YES-section 4.6

(6) periodic maintenance and site inspection limited to twice a month for first quarter, monthly thereafter YES - see section 4.6

NA = NOT APPLICABLE

FOREWORD

Subtitle I of the Hazardous and Solid Waste Amendments (HSWA) of 1984 to the Solid Waste Disposal Act (SWDA) of 1965 established a national regulatory program for managing underground storage tanks (USTs) containing hazardous materials, especially petroleum products. Hazardous wastes stored in USTs were already regulated under the Resource Conservation and Recovery Act (RCRA) of 1976. Subtitle I requires that the U.S. Environmental Protection Agency (USEPA) promulgate UST regulations. The program was designed to be administered by individual States, who were allowed to develop more stringent, but not less stringent standards. Local governments were permitted to establish regulatory programs and standards that are more stringent, but not less stringent than either State or Federal regulations. The USEPA UST regulations are found in the Code of Federal Regulations, Title 40, Part 280 (40 CFR 280) (*Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks*) and 40 CFR 281 (*Approval of State Underground Storage Tank Programs*). 40 CFR 280 was revised and published on September 23, 1988, and became effective December 22, 1988.

The Navy's UST program policy is to comply with all Federal, State, and local regulations pertaining to USTs. This report was prepared to satisfy the requirements of Chapter 17-770, Florida Administrative Code (FAC) (*State Underground Petroleum Environmental Response*) regulations on petroleum contamination in Florida's environment as a result of spills or leaking tanks or piping.

Questions regarding this report should be addressed to the Commanding Officer, Naval Station, Mayport, Florida, or to Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM), Code 1847, at 803-743-0528 (AUTOVON 563-0528).

EXECUTIVE SUMMARY

Groundwater contamination exceeding regulatory standards has been identified at the Alpha Delta Piers at Naval Station (NAVSTA) Mayport, Florida. Free product has been observed at the site in the past, but currently appears to be absent. Contaminated groundwater and possibly free product infiltrate a storm drainage pipe and discharge to the turning basin. The surficial aquifer in the vicinity of NAVSTA Mayport is classified according to the criteria specified in Chapter 17-3, Florida Administrative Code, as G-III.

A remedial strategy of containment and source abatement is proposed. The proposed containment actions will prevent future discharges of contaminated groundwater from the site into the turning basin. Source abatement actions will include monitoring and removal of any free product that may be present and the reduction of contaminant concentrations by *in-situ* biodegradation. A monitoring program is proposed that will allow for measurement of the progress of the remediation and provide feedback for maximizing the system's operating efficiency.

ACKNOWLEDGMENTS

In preparing this report, the Underground Storage Tank personnel at ABB Environmental Services, Inc., acknowledges the support, assistance, and cooperation provided by the personnel at Naval Station (NAVSTA) Mayport and Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM).

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GLOSSARY

ABB-ES	ABB Environmental Services, Inc.
BTEX	benzene, toluene, ethylbenzene, and xylenes
bls	below land surface
CA	contamination assessment
CAR	Contamination Assessment Report
CARA	CAR Addendum
CFR	Code of Federal Regulations
CLEAN	Comprehensive Long-Term Environmental Action, Navy
CTO	Contract Task Order
DFM	diesel fuel marine
FAC	Florida Administrative Code
FDEP	Florida Department of Environmental Protection
FDER	Florida Department of Environmental Regulation
ft^3	cubic feet
ft/day	feet per day
GC	gas chromatograph
GC/MS	gas chromatography/mass spectroscopy
gpm	gallons per minute
HSWA	Hazardous and Solid Waste Amendments of 1984
I	hydraulic gradient
K	hydraulic conductivity
kg	kilogram
mg	milligrams
mg/ℓ	milligrams per liter
msl	mean sea level
MLW	mean low water
μg/ℓ	micrograms per liter
NAVSTA	Naval Station
NGVD	National Geodetic Vertical Datum of 1929
NPDES	National Pollution Discharge Elimination System
NSC	Naval Supply Center
O&M	operation and maintenance
OVA	organic vapor analyzer
PAHs	polynuclear aromatic hydrocarbons
ppb	parts per billion
ppm	parts per million
RAP	Remedial Action Plan
RCRA	Resource Conservation and Recovery Act

GLOSSARY (Continued)

SOUTHNAV-FACENGCOM	Southern Division, Naval Facilities Engineering Command
SVOC	semivolatile organic compounds
SWDA	Solid Waste Disposal Act of 1965
TPH	total petroleum hydrocarbons
TRPH	total recoverable petroleum hydrocarbons
UIC	uniform identification code
USEPA	U.S. Environmental Protection Agency
UST	underground storage tank
UV	ultraviolet
V	velocity
VOA	volatile organic aromatic
VOCs	volatile organic compounds

1.0 INTRODUCTION

A Contamination Assessment Report (CAR) for the Alpha Delta Pier at Naval Station (NAVSTA) Mayport, Florida, was submitted by ABB Environmental Services, Inc. (ABB-ES), in November 1992 to Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM). A CAR Addendum (CARA) was submitted in April 1993. After submittal of the CARA, ABB-ES was authorized by SOUTHNAVFACENGCOM to develop a Remedial Action Plan (RAP). This work is being performed under Contract Task Order (CTO) No. 16 of the Comprehensive Long-term Environmental Action, Navy (CLEAN) contract.

1.1 PURPOSE. The purpose of this RAP is to present a plan for remediation of petroleum contamination at the Alpha Delta Pier site. The RAP presented herein is designed for implementation at the Alpha Delta Pier site and, when implemented, will result in a reduction of the level of petroleum-related contamination in the soil and groundwater in accordance with the requirements of Chapter 17-770, Florida Administrative Code (FAC).

1.2 SCOPE. This RAP presents the rationale for the remedial actions to be implemented at the Alpha Delta Pier. Implementation of remedial actions described in this RAP will include the following tasks:

- monitoring of existing wells for free product and manually recovering product as necessary;
- rehabilitation of the stormwater pipes in the area of contamination by the installation of slip linings;
- application of oxygen and nutrients to the vadose zone soils and aquifer to enhance natural biodegradation;
- startup testing of the system to optimize efficiency; and
- maintenance, operation, and monitoring of the system for up to 2 years.

2.0 BACKGROUND

2.1 SITE DESCRIPTION. NAVSTA Mayport is located about 15 miles east-northeast of downtown Jacksonville, Florida (Figure 2-1). NAVSTA Mayport was established in 1942 on approximately 700 acres of land. NAVSTA Mayport is primarily involved in intermediate level maintenance of equipment, ships, aircraft, and other support units assigned to that part of the Second Fleet, which is stationed at the facility.

The turning basin, where ships are docked and serviced, is located in the northern part of the station. The Alpha Delta Pier site, approximately 1,450 feet long and 70 to 80 feet wide, is located on the southwest side of the turning basin (Figures 2-2 and 2-3).

2.2 SITE HISTORY. The Alpha Delta Pier is actually two contiguous piers, Alpha Pier and Delta 1 Pier. Alpha Pier, the original pier at NAVSTA Mayport, has been constructed in stages (Figure 2-4). According to Public Works personnel, the first stage of Alpha Pier was in place by 1958. The pier bulkhead was constructed with a double wall of steel sheet piles. The space between the steel pile walls was filled with grout. The walls and grout were pinned together with 1.5-inch diameter tierods. The original wall was driven to various depths, generally extending to 49 feet below the mean low water (MLW) level, with a dredged depth of about 30 feet below MLW level. The pier was approximately 40 feet wide.

The widening of Alpha Pier began in 1980. The pier was extended laterally into the basin some 40 feet. Construction consisted of cellular cofferdams. Each cofferdam consists of steel piles, driven to depths ranging from 38 to 48 feet below MLW level. Each cell was backfilled. From the drilling program, it appears that the upper few feet of backfill may have consisted of construction debris and dredge materials, although the record construction drawings indicate the cells were backfilled with compacted sand. The top of the pier was capped with a compacted limerock base and 3 inches of asphaltic concrete. Steel sheet piles in contact with the basin water were covered with an epoxy seal to a depth of 38 feet below MLW level.

Delta Pier is divided into four parts, Delta 1 through Delta 4 piers. Only that part that adjoins Alpha Pier, Delta 1, was investigated during the contamination assessment (CA). Delta 1 was constructed in 1961. Exact construction details of the Delta Pier are unknown, but are thought to be similar to the original construction design of Alpha Pier. Delta Pier was capped with a compacted limerock base and asphaltic concrete surface.

There are existing underground utilities throughout the pier area. The approximate locations and the distribution density of the known utilities are illustrated in Figure 2-5. These utility lines include fuel and oily waste steel pipelines, electrical, stormwater, wastewater, sanitary sewer, potable water, steam, and compressed air lines. The original fuel lines were installed in 1959 and 1960. The original oily waste lines were installed in 1961. These product transfer lines transport JP-5, diesel fuel marine (DFM), and waste oil. All of these steel pipelines range between 6 and 12 inches in diameter and are connected to a distant fuel farm.

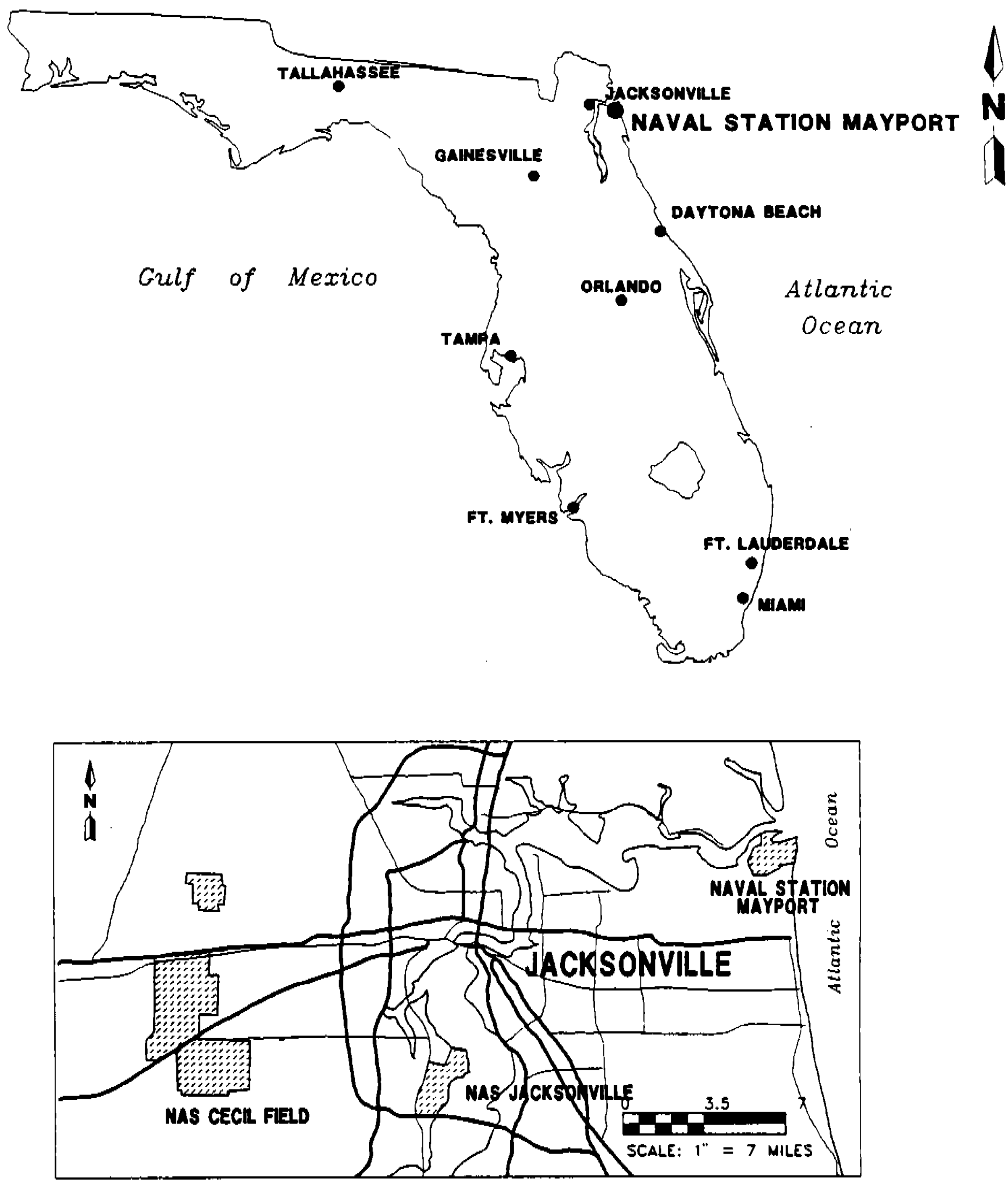


FIGURE 2-1
FACILITY LOCATION MAP

MAYLOCAT.DWG\MAH\11-17-93

REMEDIAL ACTION PLAN

ALPHA DELTA PIER
U.S. NAVAL STATION
MAYPORT, FLORIDA

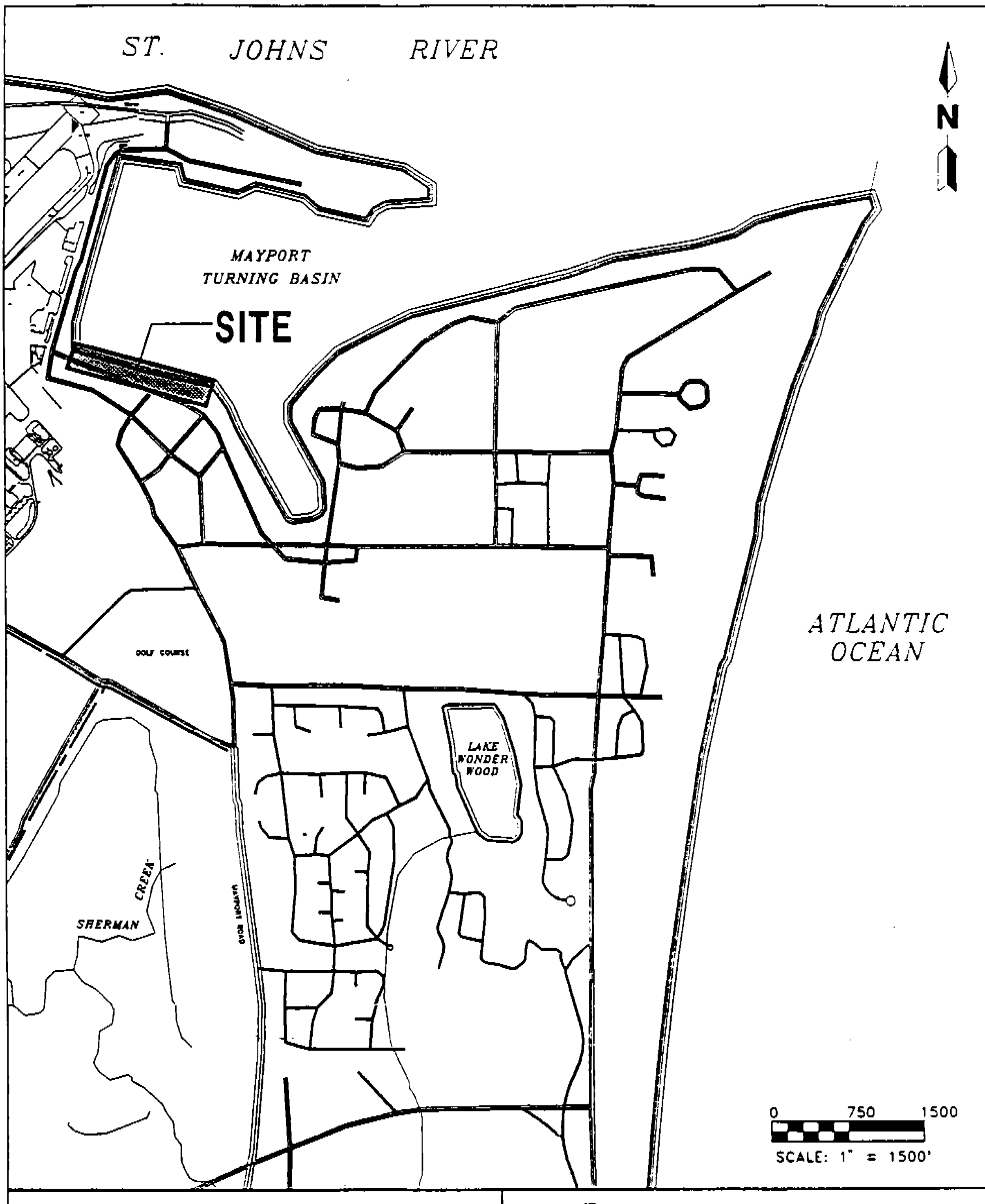


FIGURE 2-2
SITE LOCATION MAP

REMEDIAL ACTION PLAN

ALPHA DELTA PIER
U.S. NAVAL STATION
MAYPORT, FLORIDA

TANK2-2/KGP/12/06/93

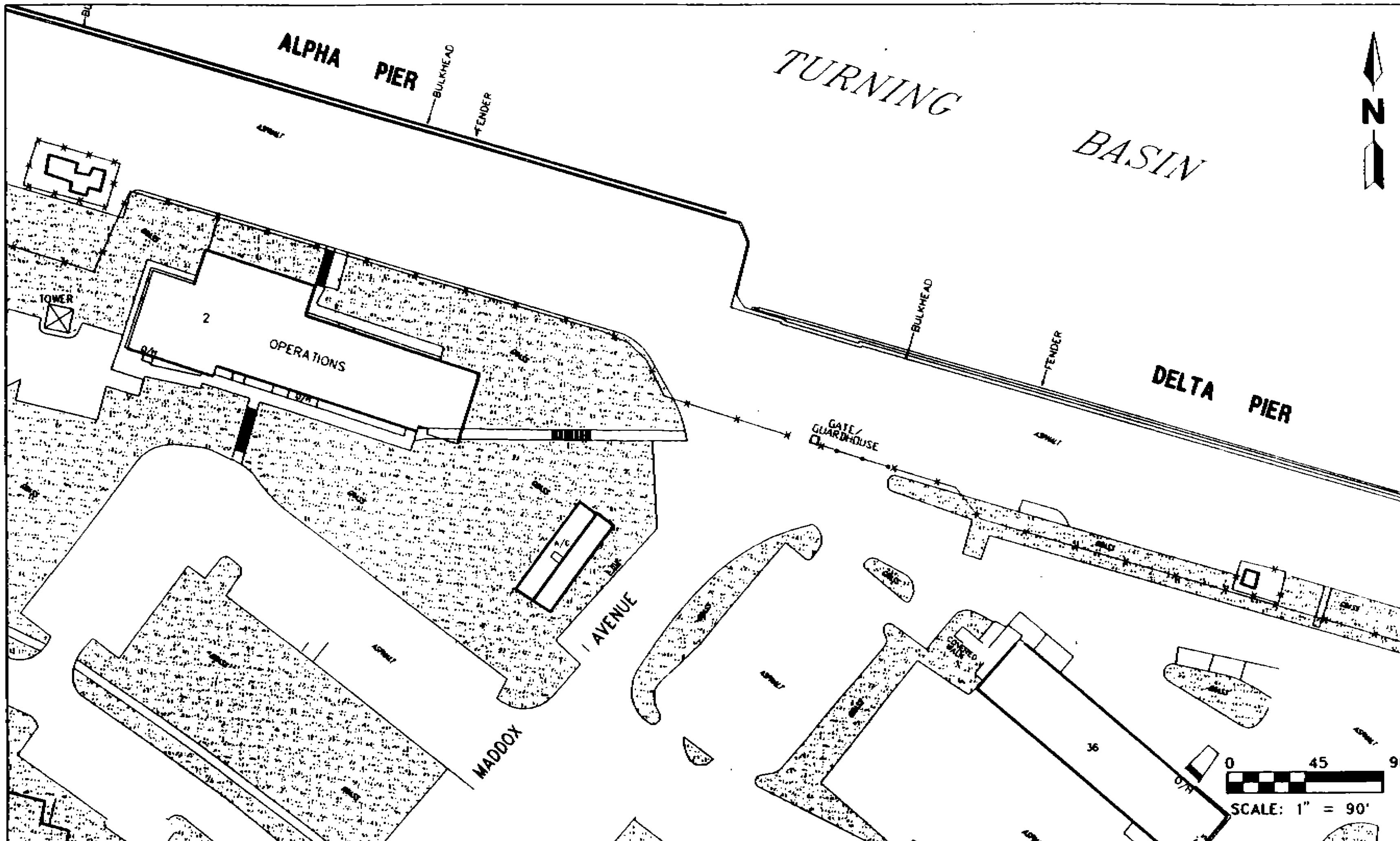


FIGURE 2-3
SITE MAP

REMEDIAL ACTION PLAN

ALPHA DELTA PIER
U.S. NAVAL STATION
MAYPORT, FLORIDA

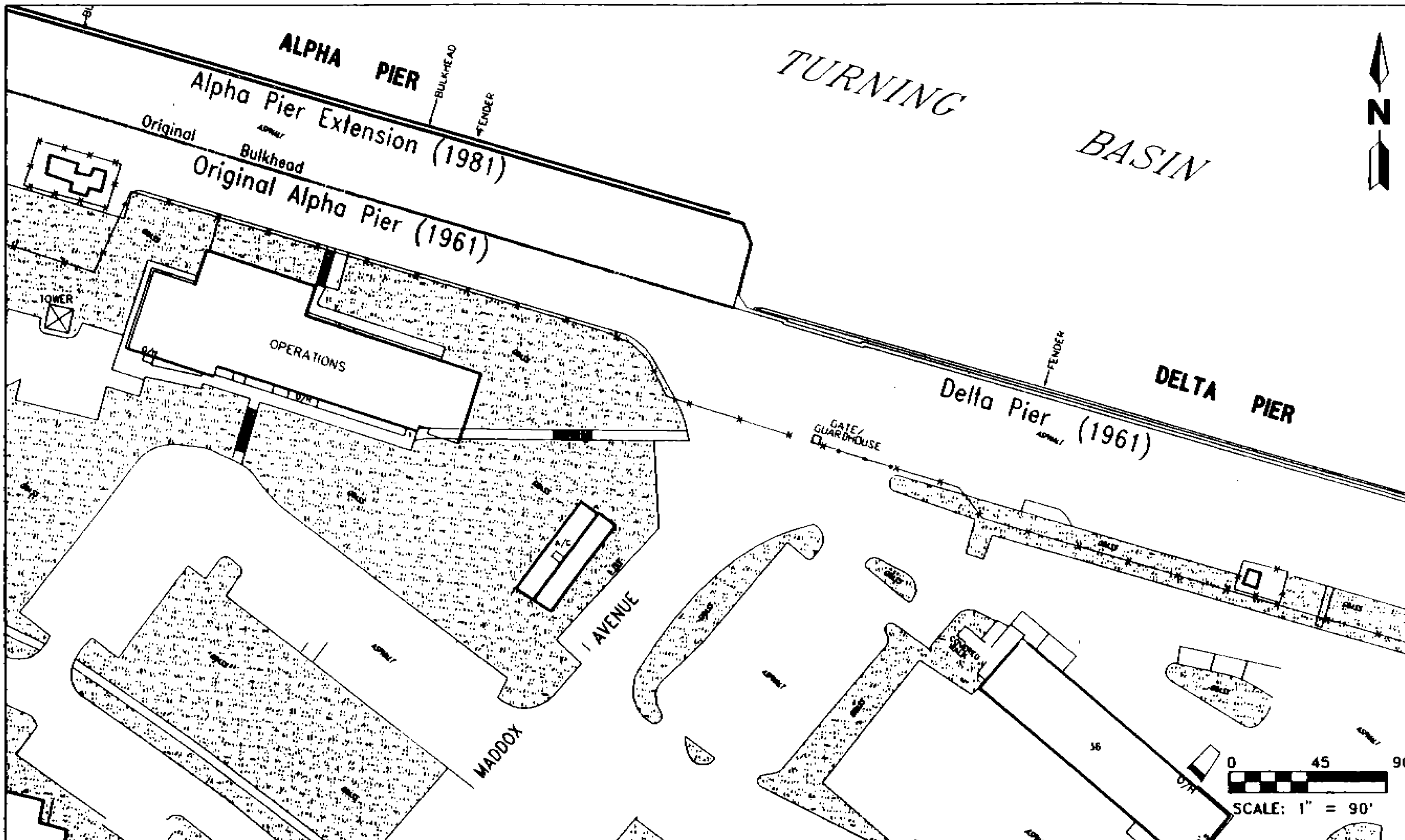
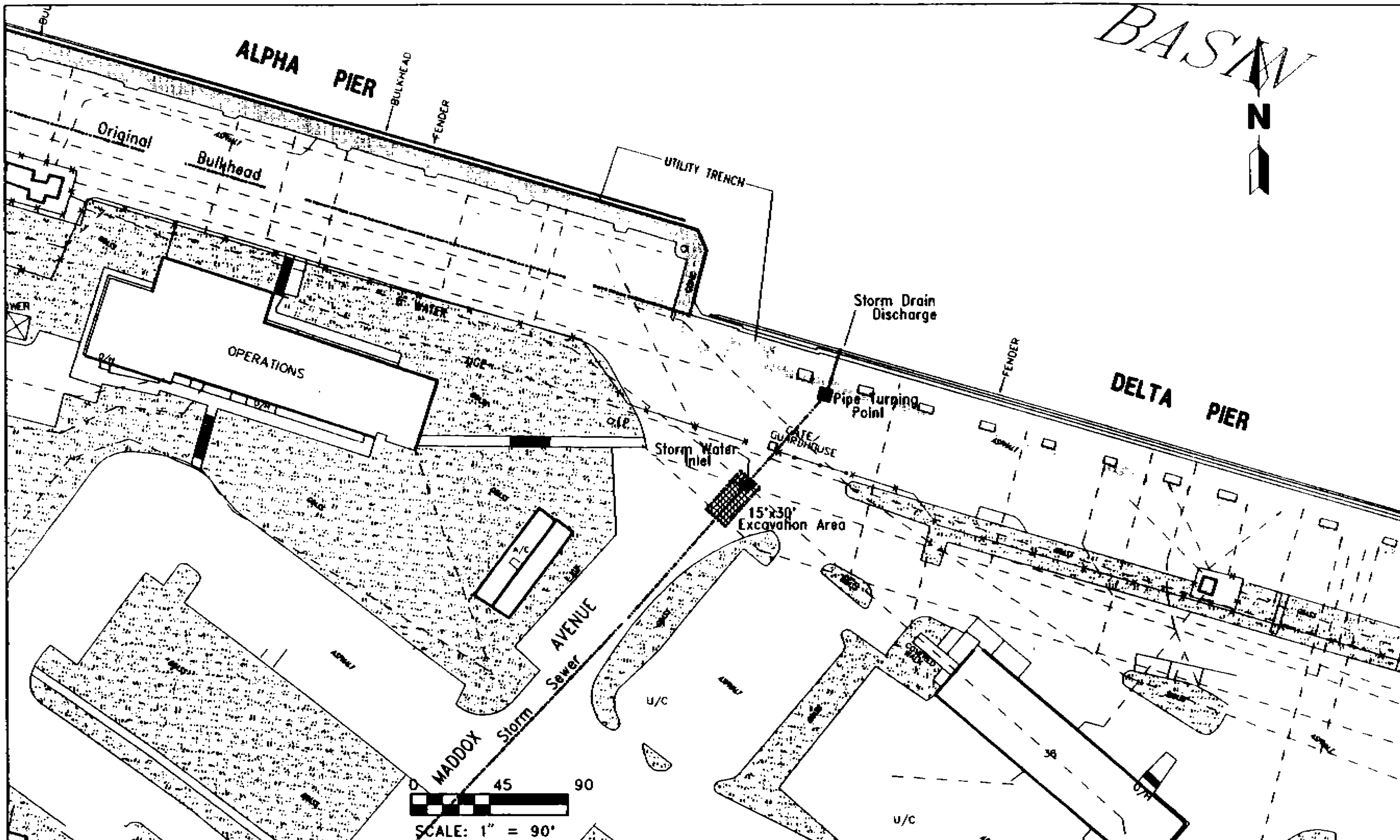


FIGURE 2-4
PIER CONSTRUCTION HISTORY

REMEDIAL ACTION PLAN

ALPHA DELTA PIER
U.S. NAVAL STATION
MAYPORT, FLORIDA

DELTPIER/KGP/10/25/93



LEGEND

- - - - - - Utility line
—×—×— Fence

FIGURE 2-5
APPROXIMATE LOCATIONS OF KNOWN UNDERGROUND UTILITIES AND OTHER OBSTRUCTIONS

REMEDIAL ACTION PLAN

ALPHA DELTA PIER
U.S. NAVAL STATION
MAYPORT, FLORIDA

In 1985, product loss was discovered in a DFM line. A break in the pipeline was detected at the junction of the Alpha and Delta piers. It was estimated that more than 500 gallons of fuel were released. Personnel from the facility's Public Works department were unable to state exactly which fuel line was involved with the product loss. The break in the line was repaired, and some lost product was recovered immediately after repairs were completed. The amount of product recovered is unknown. In August 1988, 3½ inches of free product were discovered in an electrical utility manhole. The manhole is located on Alpha Pier, south of the 1985 DFM pipeline break area. Approximately 1,000 gallons of an oil and water mixture was removed from the manhole. The pipeline break was reported in writing by the Public Works Department to the Florida Department of Environmental Regulation (FDER) (now known as the Florida Department of Environmental Protection [FDEP]) in October 1989.

In January 1990, a DFM pipeline was cut during excavation operations at the west end of Alpha pier. In a January 1990 written report to FDER, it was estimated that the amount of released product was less than 1,000 gallons. During repair operations, an unknown quantity of contaminated soils were removed from the site and transported to a permitted incineration facility.

The January 1990 report also noted the discovery of old oily waste product in the excavation area, indicating a previous product release. As a result, fitness tests were conducted on the oily waste and fuel pipelines. The oily waste mainline is a gravity flow system and does not allow for in-line testing or sampling until it is discharged into a common receiving vessel. Specific identification and location of suspect piping is not possible. As a result, the oily waste mainlines were tested with a dye tracer. The dye test indicated that an oily waste line was leaky. The test also indicated that the storm drain lines were leaky and receiving petroleum product from the lines and/or contaminated soils and groundwater.

The DFM pipeline system is regularly pressure tested by the Naval Supply Center (NSC) Fuel Department. No apparent leaks were reported to have been found in any of the pressurized lines.

In the spring of 1992, a new water line was installed at the Alpha and Delta Piers. At that time, some contaminated soil was removed from the area where the break had occurred. Some of the soil was incinerated at an offsite facility. The remainder of the soil, contained in 24 55-gallon drums, is scheduled to be or has been incinerated at an offsite facility. Subsequent to the installation of the new water line, both Alpha and Delta 1 Piers were repaved with a compacted limerock base and 4 inches of asphaltic concrete.

During periods of rain and at low tide, a sheen is sometimes evident at the discharge point of the storm sewer that empties into the turning basin near the intersection of the Alpha and Delta piers. Absorbent booms have been placed at the point of discharge of the storm sewer. The storm sewer is located between Buildings 2 and 36. The storm sewer in question is downgradient of the location of the 1985 DFM pipeline break.

<u>2.3 SUMMARY OF CONTAMINATION ASSESSMENT REPORT (CAR) FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS</u>. As a result of the various product loss events, a CA was performed by ABB-ES from June 1992 through September 1992. The objectives were to identify petroleum contaminants and their likely sources at the site, assess the degree and extent of petroleum contamination in the soil and the groundwater, and recommend remedial actions, if necessary, to attain compliance with State regulations. During this investigation, a previously unknown area of contamination was detected. Evidence indicated that the D1-2 oily waste riser, a waste receptacle at the Delta Pier, had leaked at some time in the past. This riser has not been in service for over 3 years; therefore, the contaminant source is considered abated.

Fifty-nine soil gas sample sites, 24 soil borings, 22 shallow monitoring wells, and 2 deep monitoring wells were advanced or installed at the site. Soil gas samples, organic vapor analysis samples, gas chromatograph samples, and soil and groundwater quality samples were collected. Soil and groundwater quality samples were analyzed for petroleum constituents of the used oil analytical group as defined in Chapter 17-770, FAC. The findings, conclusions, and recommendations of the CAR are summarized below.

2.3.1 CAR Findings

- Soil encountered during drilling operations was mostly fill material. Soil typically consisted of very fine-grained sand, silt, shell material, and construction debris, such as concrete. Naturally occurring sediments consisted of fine-grained sand and shell beds.

- Only the surficial, unconfined aquifer was encountered during drilling operations. The base of this aquifer was not determined during the field investigation. A literature search indicates that the base of the aquifer is approximately 70 feet below land surface (bls).

- Water in the upper part of the unconfined surficial aquifer is relatively fresh. Generally, over much of the facility, groundwater at depths greater than 40 feet bls becomes brackish and is classified as G-III. At the site, groundwater becomes brackish at depths greater than 50 feet bls.

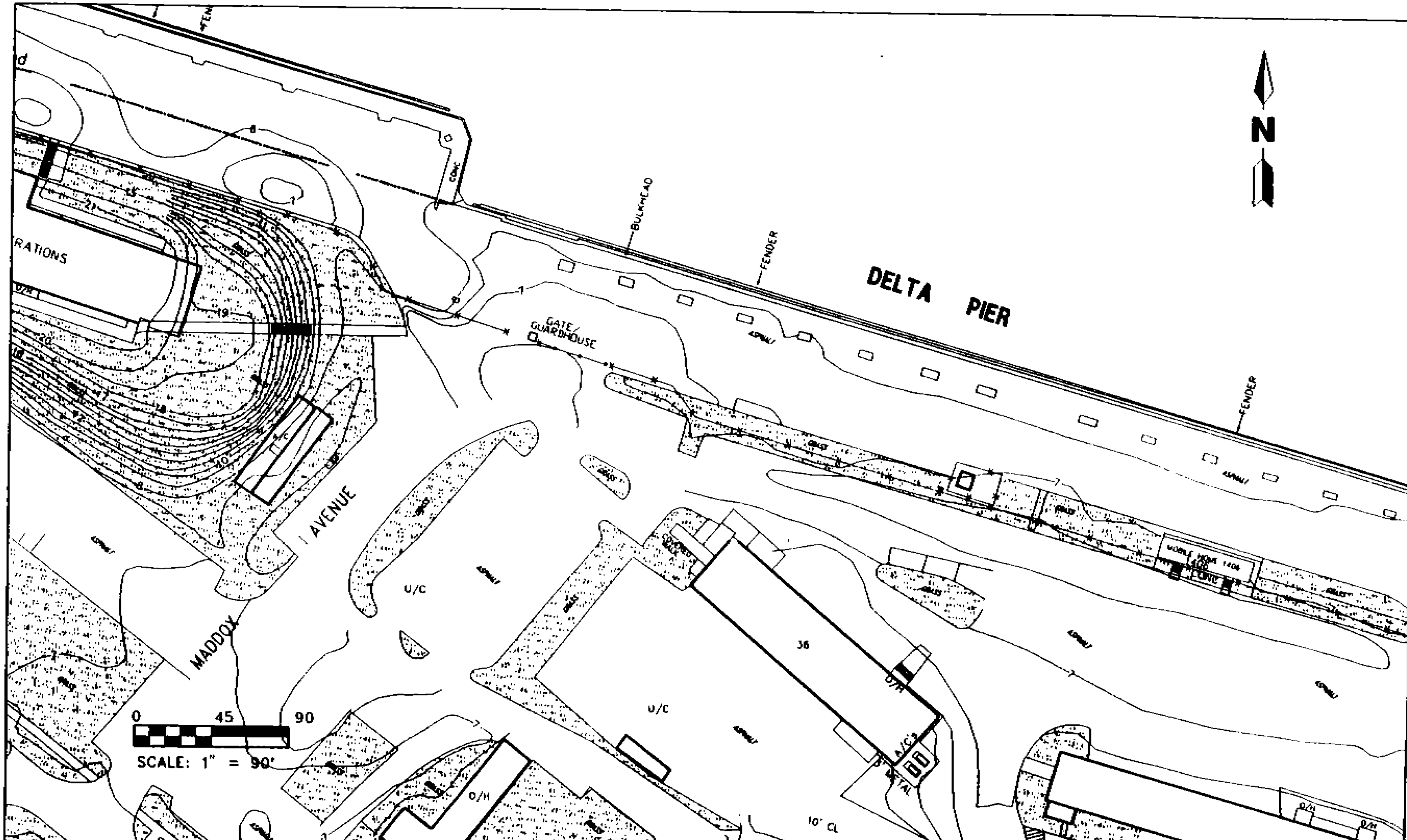
- Groundwater beneath much of the site was encountered at approximately 4.0 feet bls. At the relict beach ridge, a topographic high inland of the pier (Figure 2-6), water was encountered at up to 17 feet bls.

- The overall direction of groundwater flow is northerly toward the bulkheads and turning basin.

- Contaminated soil was detected beneath the Alpha and Delta 1 piers. Contaminated soil is located near and west of the D1-2 oily waste riser and in the vicinity of the 1985 DFM pipeline break.

- Contaminants detected in the soil include total recoverable petroleum hydrocarbons (TRPH), extractable organics, naphthalenes, volatile organic aromatics, petroleum related tentatively identified compounds, arsenic, barium, chromium, and lead.

- Free product was measured in monitoring well MPT-1406-16 with a thickness of 2 inches. The product appears to be weathered. Free product was not detected in any other monitoring well. Free product was detected in two utility (electrical and telephone) manholes. Both manholes are located



LEGEND

—— 7 —— Surface Elevation Contour

FIGURE 2-6
SITE TOPOGRAPHY

REMEDIAL ACTION PLAN

ALPHA DELTA PIER
U.S. NAVAL STATION
MAYPORT, FLORIDA

between monitoring well MPT-1406-16 and the 1985 DFM pipeline break. Free product was measured at 1 inch in one manhole and 1½ inches in the other. Free product was not detected in any other manhole.

- Groundwater contaminants identified during the CA include total volatile aromatic hydrocarbons (benzene, ethylbenzene, toluene, and xylenes [BTEX]), polynuclear aromatic hydrocarbons, total naphthalenes (naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene), TRPH, arsenic, chromium, and lead.

- Concentrations of contaminants in groundwater quality samples that equal or exceed standards or target levels as established by the FDEP for G-II groundwater include benzene, polynuclear aromatic hydrocarbons, total naphthalenes, and TRPHs.

- Groundwater contamination is located at two areas: (1) in the vicinity west of the oily waste riser, D1-2; and (2) in the vicinity of the 1985 DFM pipeline break. In general, contamination appears to be restricted to the pier areas. At the 1985 DFM pipeline break, contamination extends from the bulkhead to approximately 150 feet inland along Maddox Avenue.

- The diesel fuel marine pipeline has been repaired. The oily waste riser has been taken out of service. The sources of contamination have been abated.

- Evidence of contamination was not found during the CA at a location in the western part of Alpha Pier where a fuel pipeline was damaged.

- Petroleum sheens have been reported at various times in the turning basin. The sheens emanate from storm drain discharge water that empties into the basin. Absorbent booms have been placed at the point of discharge.

- There are 25 production and potable water wells in the area of the facility. Five potable water wells at the facility are within a ¼-mile radius of the site. All five wells are screened in the Floridan aquifer system.

- Hydraulic conductivity (K) values ranged from 33.20 to 9.06 feet per day (ft/day). The hydraulic gradient (I) was calculated to be 0.007 foot per foot. Based on the K of 21.13 ft/day and I of 0.007, the average linear pore water velocity (V) beneath the site was calculated to be 0.59 ft/day.

- The tidal influence study conducted on July 14, 1992, indicates groundwater elevation fluctuations range from 0.2 to 0.4 foot in the contaminated area during a full tidal cycle. Groundwater at 3.0 feet above the National Geodetic Vertical Datum (NGVD) of 1929 or higher appears unaffected by tidal action. Groundwater in the vicinity of the storm sewer along Maddox Avenue fluctuates more than in the area where free product has been observed.

2.3.2 CAR Conclusions

- The contamination at the Alpha Delta pier emanated from a broken pipeline and an oily waste riser. These sources have been abated.

- Soil at the site is contaminated to a depth of at least 44 feet bls. However, only the upper 4 feet is above the water table and, therefore, considered excessively contaminated soil as defined by Chapter 17-770, FAC.

- Groundwater in the unconfined surficial aquifer has been adversely impacted by petroleum constituents that exceed Chapter 17-770, FAC, groundwater cleanup target levels.

- Potable water wells have not been nor are expected to be impacted by contaminants from the Alpha Delta pier.

2.3.3 CAR Recommendations

- Free product should be recovered from the 1985 diesel fuel pipeline break site. Measures to recover the free product should be implemented as quickly as possible.

- In addition to the absorbent booms, surface skimmers should be placed at the point of discharge of the storm sewer. The use of booms and skimmers should be considered a temporary measure.

- Abandonment of the storm sewer and the sealing of the point of discharge to the turning basin should be explored as a more permanent solution to abating petroleum discharge to the basin.

- All fuel and oily waste risers and associated piping, whether they are in service or not, should be tested for possible leaks.

- All fuel and oily waste mainlines should be tested or retested for tightness. Where tightness tests are not possible, alternate test methods should be used.

- If not already in place, a petroleum products management program should be developed and implemented. This program should account for all volumes of product handled at the fuel farm and at all piers. It should also have in place procedures and action plans to address leaks, spills, and other uncontrolled discharges of petroleum products, as well as emergency remedial plans.

- Due to the presence of free product and because concentrations of the contaminants in the soil and groundwater beneath the site exceed the Chapter 17-770, FAC, cleanup target levels, ABB-ES recommends that a remedial action plan be prepared to address the contamination and initiate an appropriate course of action.

3.0 REMEDIAL ALTERNATIVES.

3.1 CONTAMINANTS OF CONCERN. Laboratory analyses indicate the contamination may be from several sources, including the DFM pipeline and the oily waste collection system. Based on the available data, the Chapter 17-770, FAC, used oil analytical group of contaminants will be the basis for the remedial design. These parameters are:

- arsenic (U.S. Environmental Protection Agency [USEPA] Methods 206.2, 206.3, 7060, or 7061),
- cadmium (USEPA Methods 200.7, 213.1, 213.2, 6010, 7130, or 7131),
- chromium (USEPA Methods 200.7, 218.1, 6010, or 7191),
- lead (USEPA Method 239.2 or 7421),
- priority pollutant volatile organics (USEPA Methods 624 or 5030/8240)
- priority pollutant extractable organics (USEPA Methods 625, 3510/8250, or 3510/8270)
- non-priority pollutant organics (with gas chromatograph/mass spectroscopy [GC/MS] peaks greater than 10 parts per billion [ppb]) (USEPA Methods 624 or 5030/8240, and 625, 3510/8250, or 3510/8270), and
- TRPHs (USEPA Method 418.1)

3.2 APPLICABLE CLEANUP STANDARDS. The surficial aquifer at the site is generally brackish, with a freshwater lens present in the upper zone. According to Franks (1980), "The local surficial aquifer acts as a single unconfined (water-table) aquifer to a depth of about 70 feet bls." The freshwater lens varies in thickness from about 40 feet, near the center of NAVSTA Mayport, to zero at the St. Johns River and the Atlantic Ocean. Franks (1980) goes on to state that "Although the water above a depth of 40 feet is fresh and initially could be used in a water supply system, after a short pumping interval brackish water from the lower zone would rise in response to a reduction in head, contaminating the upper freshwater zone." During his investigation, water in one test well, which was being pumped at about 20 gallons per minute (gpm), was observed to be gradually increasing in specific conductance after pumping for only about 30 minutes. Therefore, because the freshwater lens is not a viable potable water source and is not otherwise distinguishable from the brackish zone, the surficial aquifer is classified under Chapter 17-3, FAC, as G-III.

Action levels for remedial actions at this site are based on the upper limits of contaminant concentrations for monitoring only situations in a G-III aquifer. These parameters and target concentrations are as follows.

Parameter	Groundwater Target Concentration (ppb)	
	Source	Plume Perimeter
Total BTEX	1,000	200
Benzene	500	200
TRPH	100,000	5,000
Lead	1,000	50
Arsenic	1,000	50
Cadmium	200	5
Chromium	1,000	50

Naphthalenes and polynuclear aromatic hydrocarbons (PAHs) have been identified at the site, but are not listed as parameters for monitoring in G-III groundwater. Therefore, the standards set for monitoring only, at a source in a G-II aquifer, with no nearby wells will be used. For PAHs, this standard is 20 times the drinking water standard. For naphthalenes and PAHs detected at the site to date, the standards are as follows.

Parameter	Groundwater Target Concentration (ppb)
Total naphthalenes	2,000
Acenaphthene	400
Acenaphthylene	200
Anthracene	200
bis(2-Ethylhexyl)phthalate	120
Fluoranthene	840
Fluorene	200
Phenanthrene	200
Pyrene	200

Soil contamination at the site exceeds standards presented in Chapter 17-770, FAC. Those standards, however, are based on risks associated with contaminated soil over a potable water source aquifer. Because the surficial aquifer at this site is G-III and, therefore, not a potable water source, alternate contaminant levels are appropriate.

The Chapter 17-770, FAC, standards are based on a proportional relationship between the presence of soil contamination, as measured by an organic vapor analyzer (OVA), and the risks associated with potable water becoming contaminated by that soil. An increase in the acceptable level of soil contamination, as measured by an OVA, proportional to the increase in the acceptable level of contamination, from G-II to G-III, is recommended.

Standards for G-III groundwater near a contaminant source are used for this correlation because the contaminated soil is considered a contaminant source. The increase in acceptable levels from G-II to G-III groundwater concentrations are from 50 micrograms per liter ($\mu g/\ell$) to 1,000 $\mu g/\ell$ for total BTEX, from 1 $\mu g/\ell$ to 500 $\mu g/\ell$ for benzene, and from 5 milligrams per liter (mg/ℓ) to 100 mg/ℓ for TRPH. These increases are by factors of 20, 500, and 20, respectively. Therefore, increasing the acceptable level of soil contamination, as measured by an OVA, by a factor of 20 is recommended. The recommended acceptable OVA measured concentration is 1,000 parts per million (ppm), based on a corresponding concentration of 50 ppm at a G-II groundwater site.

3.3 **EXTENT OF CONTAMINATION**. All groundwater monitoring wells at the site were sampled on May 17 and 18, 1993. Samples were analyzed for the Used Oil analytical group parameters. The complete results of the laboratory analyses are presented in Appendix A. A summary of the analytical results is presented in Table 3-1. Free product thickness in monitoring well MPT-1406-16 was measured at 8 inches on April 22, 1993, and at 6 inches on May 17, 1993. Free product was not found in MPT-1406-16 on August 16, 1993.

3.3.1 **Soil Contamination** A definition of excessive soil contamination has been recommended for this site as soil with OVA headspace measurements exceeding 1,000 ppm. In accordance with this definition, four areas can be identified as excessively contaminated based on data in the CAR for soil at or above the water table. The measurements exceeding 1,000 ppm were taken from soil at less than 1 foot above the water table as measured at high tide (except one sample from MPT-1406-3 that was collected nearly 3 feet above the water table). Calculations presented in Appendix B show that a capillary fringe thickness of 1.25 feet or more is likely to be present at the site. Therefore, it is believed that the reported soil contamination is the result of the presence of contaminated groundwater and does not represent excessive soil contamination. This is further evidenced by the configuration of the reported soil contamination in the vicinity of the storm sewer, which runs northeast along Maddox Avenue to the Delta Pier. Groundwater flow in that area is generally from west to east. The reported soil contamination ends abruptly at the storm sewer as it moves downgradient. It is known that contaminated groundwater infiltrates into this storm sewer. Tidal influence or seasonal variations in the water table elevation may have resulted in some smearing of the free product, but these fluctuations do not appear to exceed about ½ foot. These facts indicate that the contamination is closely related to the groundwater and does not represent excessive soil contamination.

3.3.2 **Free Product** Free product was observed in MPT-1406-16 at a thickness of 2 inches during the CA. Product was observed and measured from a sample collected in a bailer. The free product was measured on August 6 and September 23, 1992. The monitoring well was installed July 8, 1992. The product was blackish in color and had a petroleum product odor. When shaken, the product dispersed into the water. The particles of product remained suspended in the water for a short period of time, possibly 2 minutes. These characteristics suggest that the product is old and/or mixed with other compounds, such as a soapy chemical. Prior to August 6, 1992, free product was not noted in the well when water volumes were collected in a bailer. Rather, the upper portion of the water column was cloudy and grayish, and droplets of product were evident on the wall of the bailer.

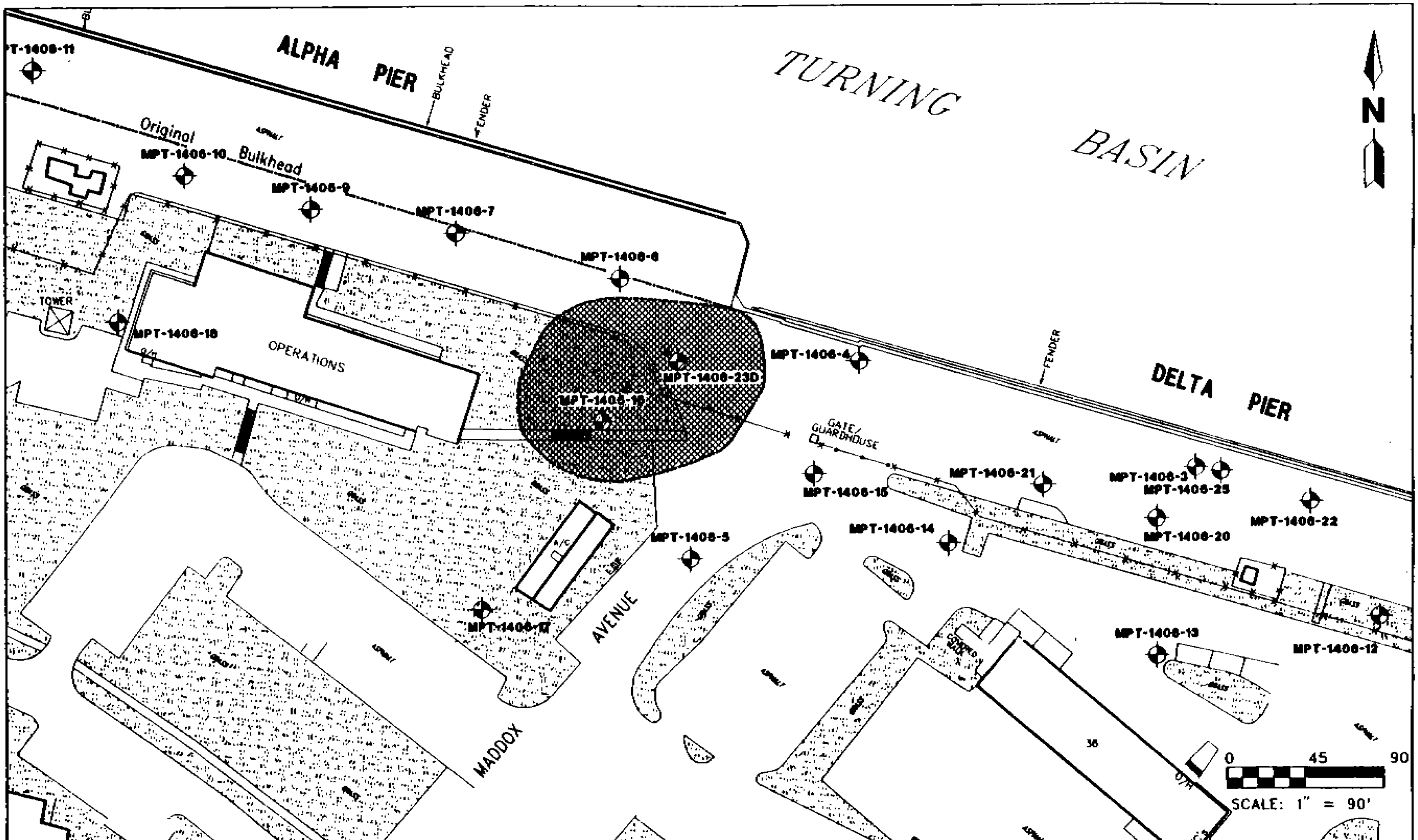
In September 1992, monitoring wells MPT-1406-16, MPT-1406-04, MPT-1406-05, MPT-1406-06, and MPT-1406-07 were examined for the presence or absence of free product. In addition, all manholes in the immediate vicinity of these wells were checked for the presence or absence of free product. Free product was detected in monitoring well MPT-1406-16 with a thickness of 2 inches. A telephone utility line manhole, just north of MPT-1406-16, had a free product thickness of 1¾ inches. The electrical utility manhole, where free product was originally discovered, also had free product at a thickness of 1½ inches. Free product was not detected in any other well or manhole.

Free product at the site may exist primarily along the underground telephone, electrical, and potable water lines southeast of the 1985 pipeline break. The underground utilities and the disturbed sediments surrounding the utilities could provide greater permeability and less resistance than the more compacted sediments, where utilities do not exist. Well MPT-1406-16 is located in an area where the soil was recently disturbed during the installation of a new potable water pipeline. The free product may not be migrating further inland or westward due to the greater hydraulic head in those directions and may not be migrating eastward along the utility pipelines because the storm drain beneath Maddox Avenue appears to act as a barrier, capturing the edge of the product plume and discharging it to the turning basin.

Since completion of the CAR, additional free product has been observed in well MPT-1406-16. A free product thickness of 8 inches was measured on April 22, 1993, and a thickness of 6 inches was measured on May 17, 1993. The variation in free product thickness does not appear to correlate with groundwater table elevation changes. Increases in free product thickness have occurred following a drop in the water table elevation, the opposite of what might be expected if product were being smeared onto the soil. It is believed that the increase in thickness between September 1992 and April 1993 may be a result of product migrating back through the area around MPT-1406-16 ,which was excavated during the water line installation prior to the installation of MPT-1406-16. Therefore, the increased thickness is not considered to be indicative of a new source. Well MPT-1406-16 was checked again on August 16, 1993, and no free product was observed. Since that time, the well has been checked on a monthly basis and free product has not been present. Further definition of the product plume is precluded by the beach ridge relict at Building 2, pier structures, and the great number of underground utility lines. Therefore, the quantity and extent of free product present, if any, cannot be precisely determined. The estimated extent of past or present free product is shown on Figure 3-1.

3.3.3 **Groundwater Contamination** A complete round of groundwater sampling was conducted on May 17, 18, and 19, 1993. Samples were analyzed for the used oil group parameters specified in Chapter 17-770, FAC. The results of these analyses are presented in Appendix A and summarized in Table 3-1. Based on target concentrations presented in Section 3.2, groundwater contamination is limited to the area of monitoring wells MPT-1406-4, MPT-1406-6, and MPT-1406-7, where the TRPH concentrations were found to exceed the target, and MPT-1406-16, where free product has been observed. However, contaminants are present over a larger area in concentrations, which, if discharged to the turning basin, might exceed Class III water quality criteria. Contaminated groundwater currently discharges to the turning basin via infiltration to the storm sewer piping along Maddox Avenue. The approximate extent of TRPH contamination is shown on Figure 3-2.

3.4 **SITE-SPECIFIC LIMITATIONS TO ALTERNATIVES**. The site contamination is located beneath an active military port facility. The site lies partially within a restricted access area, which is fenced and guarded. Part of the source area lies beneath a section of the dock that serves as a roadway. This is an active area and any construction or operation and maintenance activities that would be disruptive must be minimized. The site is also underlain by many active and abandoned utilities, including potable water mains, sanitary sewers, oily waste sewers, stormwater sewers, electrical lines, telephone lines, fuel pipelines, and service lines and risers for ship connections for each of these. Additionally, structural components of the original Alpha bulkhead and dock are present, including the original bulkhead, steel tie rods, concrete anchor walls, wooden



LEGEND

Monitoring Well Location

Free Product Location

Ⓜ Manhole Location

DELTPIER/KCP/12/06/93

FIGURE 3-1
ESTIMATED EXTENT OF PAST FREE PRODUCT

REMEDIAL ACTION PLAN

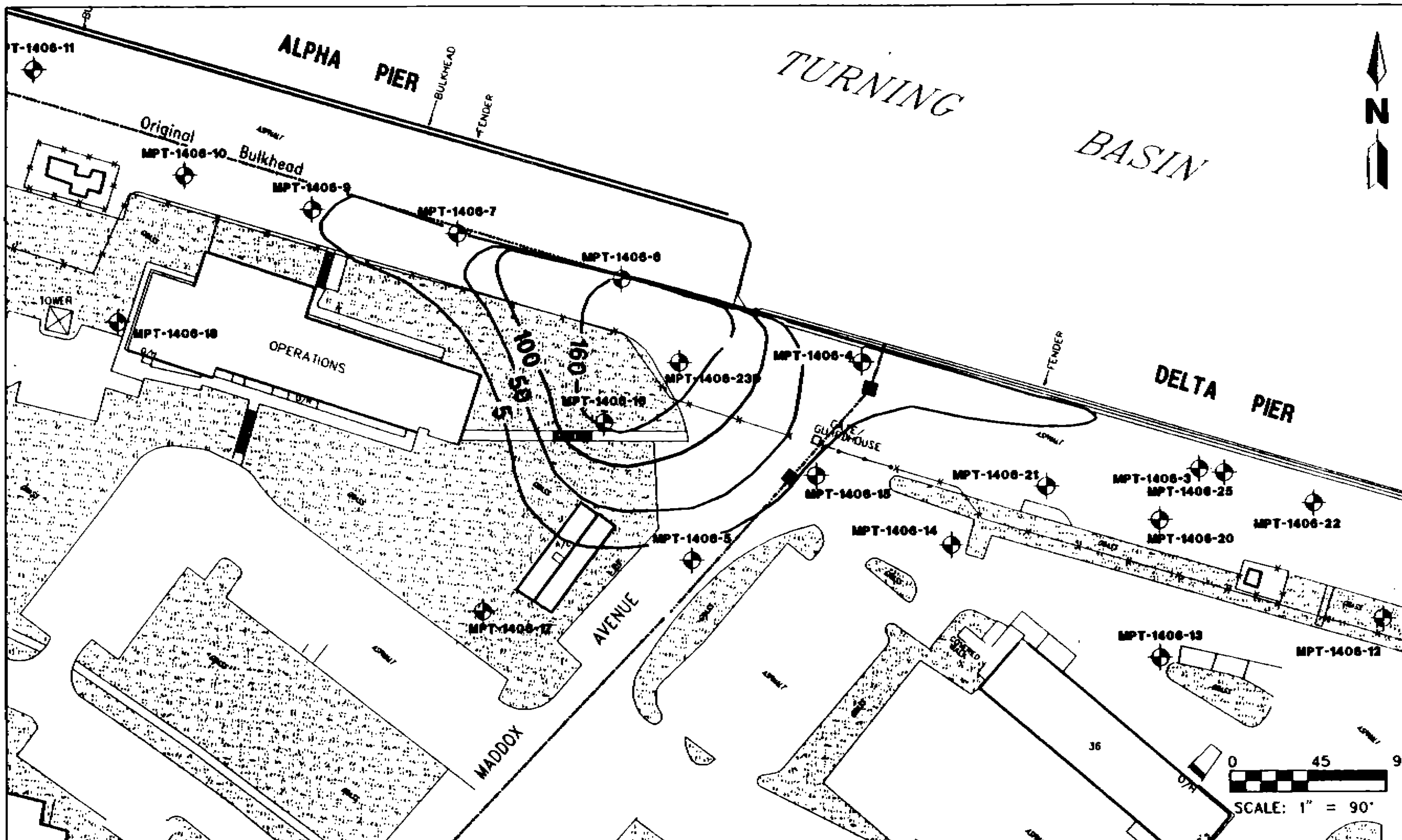
ALPHA DELTA PIER
U.S. NAVAL STATION
MAYPORT, FLORIDA

Table 3-1
Summary of Laboratory Analytical Results, May 17, 1993

Remedial Action Plan
Alpha Delta Piers
Naval Station Mayport
Mayport, Florida

	Benzene	Toluene	Ethylbenzene	Total Xylene	Total BTEX	Naphthalene	TRPH	Arsenic	Cadmium	Chromium	Lead
MPT-1406-1	1 U	1 U	1 U	1 U	1 U	10 U	1 U	10 U	10 U	50 U	6
MPT-1406-2	1 U	1 U	1 U	1 U	1 U	10 U	1 U	10 U	10 U	50 U	11
MPT-1406-3	1 U	1 U	1 U	1 U	1 U	15	3	10 U	10 U	50 U	17
MPT-1406-4	5	1 U	15	5	25	510	8	10 U	10 U	50 U	12
MPT-1406-5	1 U	1 U	1 U	1 U	1 U	10 U	1 U	10 U	10 U	50 U	5 U
MPT-1406-6	1 U	1 U	1	1	2	10 U	160	10 U	10 U	50 U	5 U
MPT-1406-7	1 U	1 U	1 U	1 U	1 U	12	59	10 U	10 U	50 U	15
MPT-1406-8	1 U	1 U	1 U	1 U	1 U	10 U	1 U	10	10 U	50 U	5 U
MPT-1406-9	1 U	1 U	1 U	1 U	1 U	10 U	3	36	10 U	50 U	16
MPT-1406-10	1 U	1 U	1 U	1 U	1 U	10 U	1 U	10 U	10 U	50 U	35
MPT-1406-11	1 U	1 U	1 U	1 U	1 U	10 U	1 U	10 U	10 U	50 U	5
MPT-1406-12	1 U	1 U	1 U	1 U	1 U	10 U	1 U	16	10 U	50 U	30
MPT-1406-13	1 U	1 U	1 U	1 U	1 U	10 U	1 U	35	10 U	50 U	14
MPT-1406-14	1 U	1 U	1 U	1 U	1 U	10 U	1 U	14	10 U	50 U	5 U
MPT-1406-15	1 U	1 U	1 U	1 U	1 U	10 U	1 U	12	10 U	50 U	6
MPT-1406-16	FP	FP	FP	FP	FP	FP	FP	FP	FP	FP	FP
MPT-1406-17	1 U	1 U	1 U	1 U	1 U	10 U	1 U	14	10 U	50 U	6
MPT-1406-18	1 U	1 U	1 U	1 U	1 U	10 U	1 U	10 U	10 U	50 U	5 U
MPT-1406-19	1 U	1 U	1 U	1 U	1 U	10 U	1 U	10 U	10 U	50 U	5 U
MPT-1406-20	1 UR	1 UR	1 UR	1 UR	1 UR	10 UR	1 UR	10 UR	10 UR	50 UR	14 R
MPT-1406-21	1 U	1 U	1 U	1 U	1 U	10 U	1 U	10 U	10 U	50 U	11
MPT-1406-22	1 U	1 U	1 U	1 U	1 U	29	1 U	10 U	10 U	50 U	7
MPT-1406-23D	1 U	1 U	1 U	1 U	1 U	10 U	1 U	10 U	10 U	50 U	5 U
MPT-1406-24D	1 U	1 U	1 U	1 U	1 U	10 U	1 U	10 U	10 U	50 U	5 U
MPT-1406-TEST	1 U	1 U	1 U	1 U	1 U	10 U	1 U	10 U	10 U	50 U	5 U
MPT-1406-DUP1	1 U	1 U	1 U	1 U	1 U	10 U	1 U	10 U	10 U	50 U	6
MPT-1406-DUP2	1 U	1 U	1 U	1 U	1 U	10 U	1 U	18	10 U	50 U	31
MPT-1406-DUP3	1 U	1 U	1 U	1 U	1 U	10 U	1 U	13	10 U	50 U	5 U
MPT-1406-EB1	1 U	1 U	1 U	1 U	1 U	10 U	1 U	10 U	10 U	50 U	5 U
MPT-1406-EB2	1 U	1 U	1 U	1 U	1 U	10 U	1 U	10 U	10 U	50 U	5 U
MPT-1406-EB3	1 U	1 U	1 U	1 U	1 U	10 U	1 U	10 U	10 U	50 U	5 U

Notes: All concentrations are in micrograms per liter ($\mu g/\ell$).
BTEX = benzene, toluene, ethylbenzene, and xylene.
TRPH = total recoverable petroleum hydrocarbons.
U = not detected above reporting limit.
R = data rejected, results do not meet quality assurance/quality control (QA/QC) requirements.
FP = free product was present.



LEGEND

- Monitoring Well Location
- Contamination Isoconcentration Line (all concentrations in parts per million (ppm))

FIGURE 3-2
TRPH CONTAMINANT PLUME

REMEDIAL ACTION PLAN

ALPHA DELTA PIER
U.S. NAVAL STATION
MAYPORT, FLORIDA

structural piles, and tie rod support blocks. All of these subsurface features greatly restrict excavation, drilling, and trenching activities at the site.

3.5 REMEDIAL STRATEGY. Because soil contamination was detected only at or near the water table surface and the water table is typically at about 4 feet bls, a separate soil remedial system is not recommended. The potential discharge of contaminated groundwater into the turning basin is considered the principal threat. To mitigate this threat, a strategy of containment and source abatement is proposed. Containment should be provided that will prevent future discharges of contaminated groundwater from the site into the turning basin. Source abatement should include removal of any free product that may be present and the reduction of contaminant concentrations. A monitoring program should also be provided, which will allow for measurement of the progress of the remediation and provide feedback for maximizing the systems operating efficiency.

3.6 DISCUSSION OF ALTERNATIVES. After defining the contaminants of concern, the applicable cleanup standards, and the extent of contamination and developing a remedial strategy, it is necessary to identify and screen technologies that may be applicable to mitigating the contamination at the site. Because cleanup technologies applicable to sites contaminated with petroleum substances are continually being improved and developed, it is important to develop remedial action alternatives using the most effective technologies available.

3.6.1 Free Product Recovery A free product removal program is in progress at the site on a monthly basis. Free product thicknesses up to 8 inches have been observed in well MPT-1406-16, but no free product has been found during the last 5 months. Based on this history, several options may be applicable. One option is to assume that free product is no longer a concern at the site and take no further actions. While there currently appears to be no need for free product recovery, this option does not address the fact that the observed presence of free product has been variable, and the possibility of free product reappearing exists.

Another option is to assume that free product will return and that a free product recovery system is needed. Such a system might include a product recovery well and a product only pumping system, which removes the free product without pumping any groundwater, or a total fluids system, which removes free product and groundwater together. Choosing the appropriate method would depend on the selected groundwater remedial alternative.

A third option is to continue monthly monitoring and free product recovery by manual methods when necessary. Such a program could be modified for more or less frequent product recovery as needed. This option would assure that any free product present would be dealt with, but would not be expensive to implement.

3.6.2 Groundwater Remediation In general, groundwater may be remediated *in-situ* or *ex-situ*. These two general scenarios are discussed separately below. Either scenario could be applied along with the containment strategy.

3.6.2.1 ***In-Situ* Treatment** This alternative would consist of treating the groundwater to reduce the mobility, toxicity, and/or volume of the contamination without removal. The only *in-situ* treatment technology considered is bioremediation. Other alternatives such as *in-situ* air stripping or sparging are not considered feasible because of the high water table and the resulting difficulty in collecting the off gases as soil vapors.

In-situ bioremediation typically involves the delivery of nutrients to bacteria, which degrade the petroleum products, breaking them down to carbon dioxide and water. Some type of initial testing is typically required to assess the existing level of biological activity and the appropriate nutrient supplements needed to effect the biodegradation. This technology has been used successfully to reduce volatile organic compound (VOC) contaminant levels. Implementation would require a system for delivering the nutrients and oxygen to the contaminated zone of the aquifer. The biological processes may be difficult to control *in-situ*, and oxygen and nutrients may be difficult to deliver due to site pavement and numerous underground utilities.

3.6.2.2 ***Ex-Situ* Treatment** This alternative would consist of collecting the contaminated groundwater, treating it to reduce its mobility, toxicity, and volume, and disposing of the treated effluent. The groundwater would be collected through extraction wells or recovery trenches. Use of this option would require greater treatment than *in-situ* alternatives in order to meet effluent disposal requirements. Treatment technologies considered include ultraviolet (UV)/oxidation, biological treatment, air stripping, and carbon adsorption.

UV/oxidation is a process in which organic contaminants in extracted groundwater are oxidized through simultaneous application of UV light with ozone and/or hydrogen peroxide. Pretreatment for removal of naturally occurring inorganics (e.g., iron, lead, or manganese) may be required to prevent fouling of the oxidation system. UV/oxidation has not been as widely used for petroleum cleanups as air stripping or carbon adsorption, but can be an effective technology for treating VOC contaminated water.

Biological treatment is a process that destroys organics through biodegradation, acclimation-degradation, or chemical conversion of the organic wastes by introducing the extracted groundwater to either an aerobic or anaerobic biological treatment process. Microorganisms and nutrients (if needed) are added to induce one or more of the responses. Site VOC concentrations must be able to support the biological processes for this to be feasible. Implementation may require additional testing and secondary treatment may be needed to achieve target concentrations. If onsite effluent disposal is used, bioenhancement of the effluent could be used with any of the *ex-situ* treatment alternatives. This would involve adding oxygen and/or nutrients to the treated effluent and returning it to the contaminated area to promote biological activity in the aquifer.

Air stripping is a technology that is proven effective for removal of VOCs and some semivolatile organic compounds (SVOCs). It reduces concentrations of VOCs through intimate contact of extracted groundwater with air. Water descends a packed column while air is forced up the column to promote mass transfer of organics from aqueous to gaseous phase. Off gases may require further treatment to meet air regulations. Pretreatment for removal of naturally occurring inorganics (e.g., iron, lead, and manganese) may be required to prevent fouling of air strippers.

Carbon adsorption is a proven technology for removing VOCs and SVOCs from groundwater, but typically is not cost effective for treating groundwater with high VOC or SVOC concentrations. It is easily implemented, although periodic changeout of spent carbon is required. Disposal of spent carbon is also a consideration. Carbon adsorption may be used, with another technology, as a polishing step.

3.6.3 Groundwater Extraction If *ex-situ* treatment of groundwater is selected, a groundwater extraction method must be selected. Alternatives considered include extraction wells, combined vapor-fluid vacuum extraction systems, and recovery trenches.

Extraction wells consist of one or more wells from which groundwater can be pumped to the treatment system. Wells are designed based on the location of the contamination, the aquifer hydraulic conductivity, the hydraulic gradient of the water table, and the depth to the water table. The well depth, diameter, screen length, pumping rate, drawdown, and the number and location of wells are designed to produce the appropriate capture zone. This is a widely used and accepted groundwater recovery method.

Combined vapor-fluid vacuum extraction systems consist of vacuum pumps that remove soil vapors and dewater the selected zone simultaneously. The systems typically are similar to well point dewatering systems with draw tubes within the wells for water removal and valving to distribute the vacuum between water and vapor recovery. If a saturated portion of the aquifer is dewatered, air continues to flow through the pores allowing remediation to continue. This is particularly an advantage in aquifers with low transmissivities. Because the depth of dewatering is controlled by the magnitude of the vacuum, the affected area is automatically maintained during variations of the adjacent water table. This method has a physical limitation on the depth from which water can be removed. Theoretically, a perfect vacuum can support a water column of about 34 feet (one atmosphere). In application, this method can typically lift water from 18 to 20 feet below the elevation of the vacuum pump.

Recovery trenches typically consist of perforated pipe laid in a trench, which is backfilled with a material that is more permeable than the surrounding soil. Groundwater flows by gravity into the pipe and to a sump where it is collected and pumped to the treatment system. Recovery trenches can be placed at the center of a contaminated area with a shallow water table gradient to collect water from all directions, or downgradient and perpendicular to the flow direction to intercept the flow at sites with greater water table gradients.

3.6.4 Effluent Disposal If *ex-situ* treatment of groundwater is selected, disposal of the treated effluent must be considered. The options considered include discharge to the NAVSTA Mayport sanitary sewer system, reinjection to the groundwater, and discharge to a surface water body. The NAVSTA Mayport wastewater treatment plant has sufficient capacity to accept the treated effluent. Although a permit to discharge to this system will be required, disposal costs associated with this option would be low. The soil at the site is suitable for disposing of the treated effluent through a recharge gallery, although the possible locations of a gallery would be limited due to the high water table and surface topography. Use of this option would allow biological enhancement of the remediation by adding nutrients to the effluent prior to reinjection, but would require a more stringent cleanup criteria. Discharge to a surface water body would be easy to implement, but would require a National Pollution Discharge Elimination System (NPDES) permit. The permit monitoring requirements, which might include more frequent effluent sampling and bioassays, would add significantly to the cost of this option.

3.7 ALTERNATIVE SELECTION. A mechanical free product recovery system (e.g. product recovery well and pump) is not considered appropriate for this site. A program of scheduled monitoring and manual product recovery as necessary is proposed. *In-situ* bioremediation is selected for site groundwater remediation because it destroys the contaminants and will minimize the disruption of site activities and subsurface utilities. The *in-situ* option is preferred to the pump and treat alternatives because it doesn't require any handling of contaminated groundwater. This eliminates the need for extensive recovery, treatment, and disposal equipment, reduces operation and maintenance (O&M) requirements, and avoids concerns associated with effluent disposal. Because the site is located in a G-III aquifer, *in-situ* bioremediation can sufficiently reduce the contaminant concentrations to an acceptable level cost effectively.

4.0 RECOMMENDED REMEDIAL ACTION

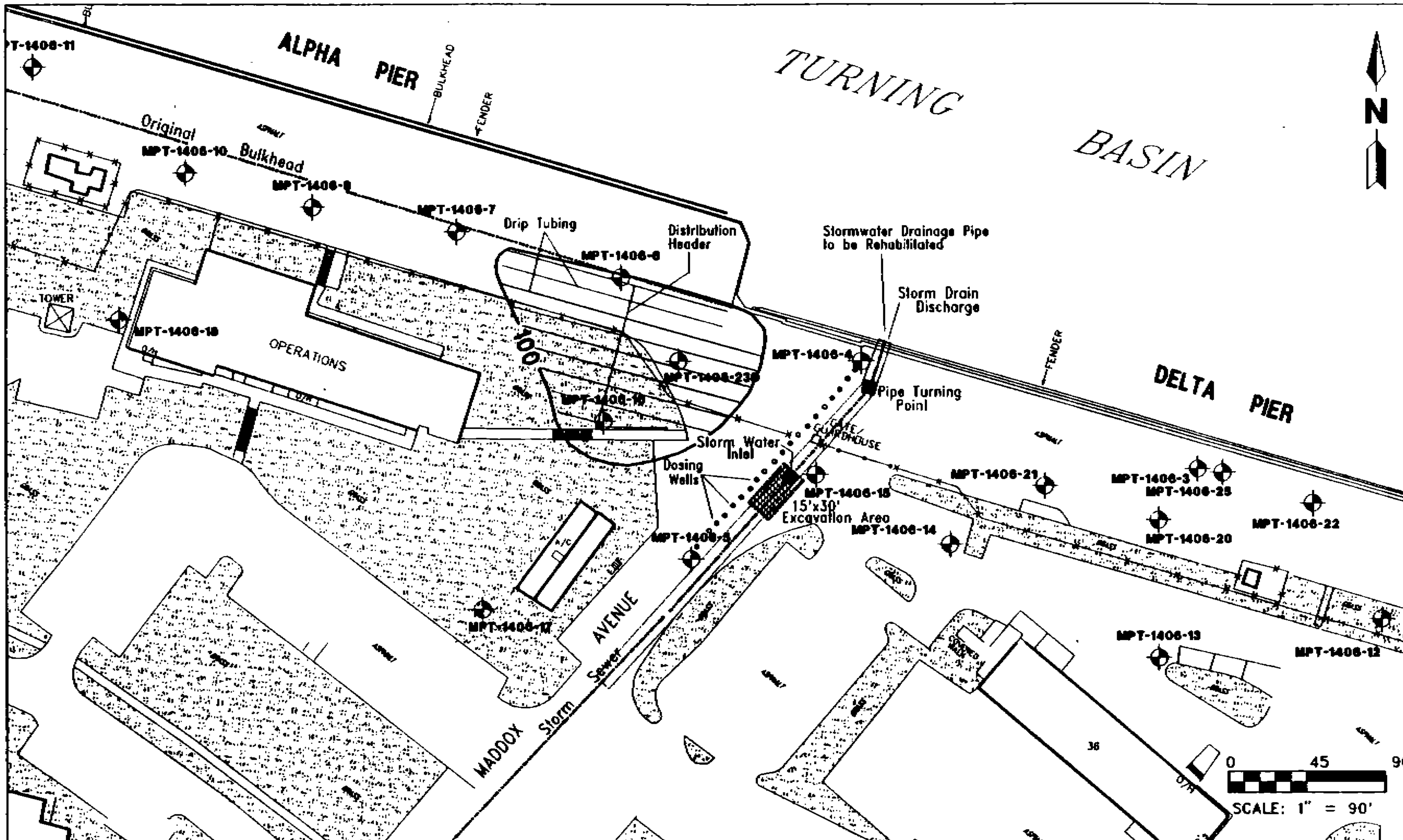
The recommended remedial action for the Alpha Delta Pier at NAVSTA Mayport consists of containment of the contaminant plume behind the existing bulkheads and source abatement through a free product monitoring and recovery program and groundwater treatment by *in-situ* bioremediation. The remedial system layout is shown in Figure 4-1.

4.1 PLUME CONTAINMENT. Contaminated groundwater appears to be migrating from the source area near well MPT-1406-16, downgradient toward the original Alpha and current Delta bulkheads. Because the bulkheads are nearly impermeable, the contaminated groundwater then moves laterally, a short distance to the west, but primarily to the east. The movement to the east is primarily the result of drawdown effects of the storm drainage pipe underneath Maddox Avenue. The pipe is currently functioning as an interception trench, capturing a portion of the contaminant plume and discharging it to the turning basin. To counter this induced groundwater flow and contaminant discharge, the storm drainage pipe will be retrofitted with a slip lining. This will eliminate the infiltration of groundwater, thereby reducing the groundwater gradient and plume migration and eliminating the discharge of contaminated groundwater from the site to the turning basin.

The contaminant plume is contained to the south by the groundwater gradient, which slopes to the north toward the bulkheads at the docks (Figure 4-2). The bulkheads provide an effective barrier, containing the plume on its north side. At the Alpha pier, there are two bulkheads between the contaminated groundwater and the turning basin. The first, constructed around 1960, consists of a double wall of interlocking steel sheet piles, driven to a depth of -49 feet MLW. The space between the sheet pile walls was filled with grout. The Delta bulkhead is an extension of the original Alpha bulkhead and is of similar construction. A second bulkhead was installed at the Alpha pier in front of the old bulkhead around 1980 when the docks were extended into the turning basin. The new bulkhead consists of interlocking steel sheet piles driven to form overlapping cells, approximately 42 feet in diameter, and backfilled with compacted sand. The sheet piles were driven to depths from -38.75 feet MLW on the landward side to -46.5 feet MLW at the water, and coated with an epoxy resin to a depth of -38 feet MLW. The filled cells were capped with concrete, which extends down the face of the bulkhead to -3 feet MLW. The bulkheads are low permeability barriers that restrict the contaminant plume migration. The bulkhead design is shown on Figure 4-3.

The water table slopes towards the bulkheads and flattens as groundwater piles up against them. This flattening has allowed lateral spreading of the plume to the west. There is a slight gradient to the east along the bulkhead, which appears to have retarded plume movement to the west. Were it not for the storm drainage pipe at Maddox Avenue, the plume would be expected to slowly follow an eastward migration path along the bulkheads (which extend approximately 4,000 feet beyond the current plume location).

Groundwater infiltration to the storm drainage pipe along Maddox Avenue has created a potentiometric low in that area (Figure 4-2). Contaminated groundwater and, possibly, free product have infiltrated the pipe and discharged to the



LEGEND

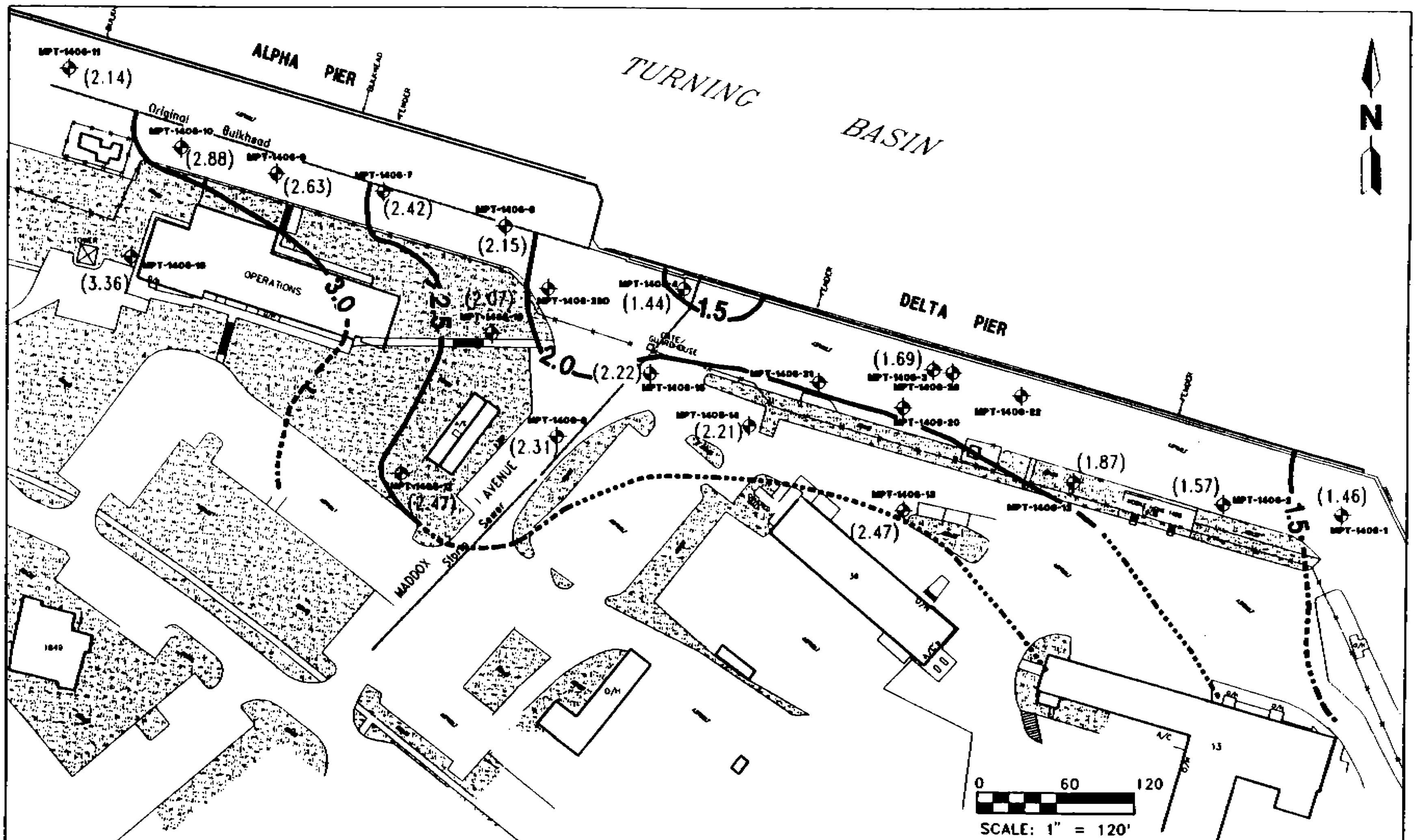
- Monitoring Well Location
- Contamination Isoconcentration Line
(All concentrations in parts per million (ppm)

DELTPIER/KGP/10/25/93

FIGURE 4-1
REMEDIAL SYSTEM LAYOUT

REMEDIAL ACTION PLAN

ALPHA DELTA PIER
U.S. NAVAL STATION
MAYPORT, FLORIDA



LEGEND

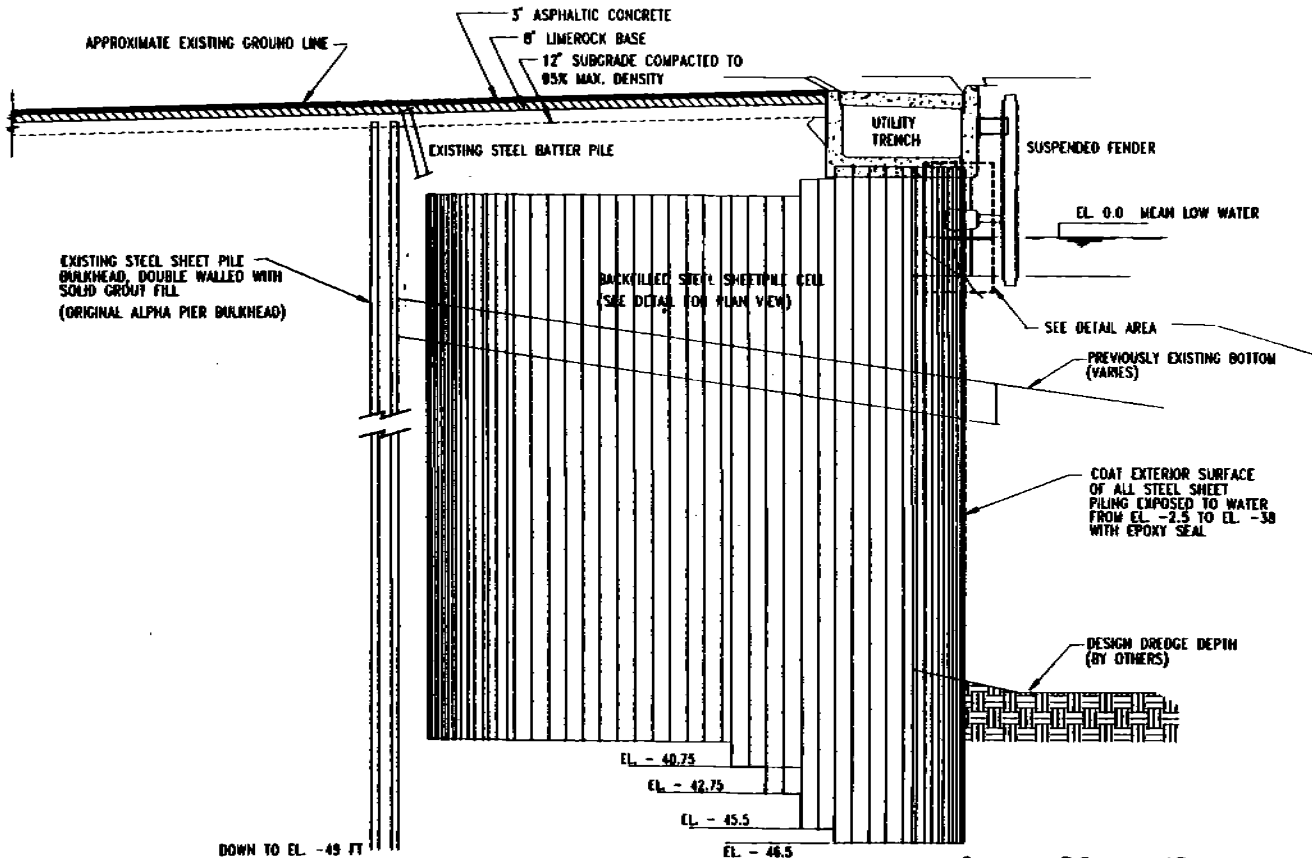
- Monitoring Well Location
- Groundwater Elevation Isopleth Dashed where inferred Contour interval = 0.5 feet in feet above MSL

DELTPIER/KGP/12/06/93

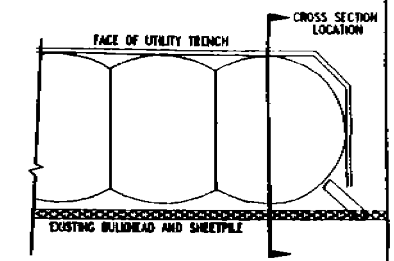
FIGURE 4-2
GROUNDWATER ELEVATION CONTOUR MAP

REMEDIAL ACTION PLAN

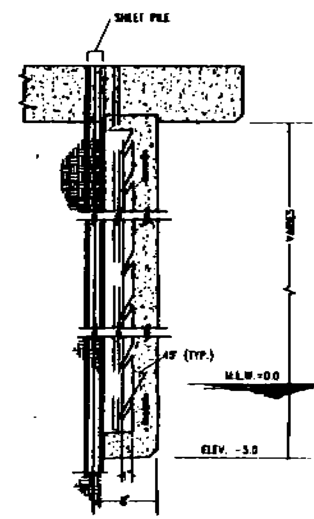
ALPHA DELTA PIER
U.S. NAVAL STATION
MAYPORT, FLORIDA



ALPHA PIER CROSS SECTION
SCALE: 1" = 15'
SOURCE: NAVFAC DRAWING No. 5058895



TYPICAL PLAN OF SHEET PILES
SCALE: 1" = 50'
SOURCE: NAVFAC DRAWING No. 5058895



PIER BRACKET DETAIL
SCALE: 1" = 2'
SOURCE: NAVFAC DRAWING No. 5058894

PIER/KGP/10/28/93

FIGURE 4-3
ALPHA PIER CROSS SECTION

REMEDIAL ACTION PLAN

ALPHA DELTA PIER
U.S. NAVAL STATION
MAYPORT, FLORIDA

turning basin. To stop the infiltration and discharge of contaminants, the pipe will be retrofitted with plastic slip liners. The annulus between the existing pipe and the new liners will be grouted. This will effectively complete the containment of the plume by flattening the eastward gradient and reducing the plume's rate of migration. The drainage pipe will be lined from its discharge point at the Delta Pier bulkhead to a point approximately 250 feet inland (Figure 4-1). A more detailed description of the liner material and installation process is presented in Appendix B.

4.2 *IN-SITU* BIOREMEDIATION. Bioremediation is an effective means to clean up contamination due to petroleum products. *In-situ* groundwater bioremediation can reduce the concentrations of the dissolved material in groundwater as well as promote the degradation of petroleum hydrocarbons adsorbed to the soil. In this manner, *in-situ* bioremediation acts at the source of the contamination to reduce contamination of water moving into the contaminated area.

To reduce the concentration of dissolved TRPH and other petroleum contaminants, an *in-situ* biological treatment system will be used at the Alpha Delta Pier. This biological component is designed to promote passive, natural attenuation of the petroleum contamination presently contained behind the bulkheads. In addition to reducing the concentration of dissolved organics, the bioremedial system is also intended to promote degradation of any fuel sorbed to the soil downgradient of the source area.

The principle behind *in-situ* bioremediation is to improve environmental conditions in the saturated zone to induce biological degradation of organic compounds by the naturally occurring population of subsurface microorganisms. Often the natural population has the ability to degrade the compounds of interest, but is limited by inadequate environmental conditions such as shortage of nutrients or electron acceptors (oxygen).

Petroleum-degrading bacteria are commonly found in subsurface soils and groundwater and are present at the Alpha Delta Pier site. Results from laboratory analyses indicate that the most limiting environmental condition for biodegradation of dissolved contaminants at the Alpha Delta Pier is oxygen concentration (electron acceptor). Laboratory testing was conducted to evaluate the feasibility of using bioremediation to treat petroleum contamination in the groundwater at the Alpha Delta Pier site. The testing was performed by the ABB-ES Treatability Laboratory in Wakefield, MA. The test methods and results are discussed in Appendix B.

The proposed approach is to deliver oxygen in a passive manner through oxygen dosing wells and infiltration systems without withdrawing and reinjecting water. Oxygen delivery will be accomplished by adding slow release magnesium peroxide to dosing wells and hydrogen peroxide through the infiltration system. The magnesium peroxide works by continually releasing oxygen into the groundwater. In zones where oxygen is delivered, the indigenous hydrocarbon degrading bacteria will biodegrade the dissolved hydrocarbon. The amount of hydrocarbon that can be removed is directly proportional to the amount of oxygen that is delivered to the subsurface. For every 2.5 Moles of oxygen that is delivered, 2 Moles of hydrocarbon will be transformed to carbon dioxide and water.

Two systems are proposed to treat the contaminated aquifer at the Alpha Delta Pier site. One system treats the "source" area, which currently has aqueous TRPH concentrations greater than 100 ppm. The second system treats the downgradient (eastern) portion of the plume to ensure that aqueous TRPH concentrations at the perimeter do not exceed 5 ppm.

The source area biological treatment system involves adding water containing hydrogen peroxide and other added nutrients using a drip irrigation type system. The nutrients and oxygen added through the system will promote biodegradation of the contaminated vadose zone, and saturated soil and groundwater within the source area.

The perimeter treatment system will be installed at the downgradient edge of the plume. Oxygen in the form of a slow release magnesium peroxide will be added to the aquifer by slowly dissolving as the groundwater flows through wells intersecting the natural groundwater flow. As a result of oxygenation, aerobic microorganisms within the downgradient soil will be stimulated to metabolize the petroleum hydrocarbon compounds. In this way, a plume interception bioremedial zone will be established downgradient of the oxygen addition wells. As long as oxygen is added to these wells, downgradient migration of contaminants should be reduced.

4.2.1 Source Area System

4.2.1.1 **Source Area Contaminant Mass Loading** The average groundwater TRPH concentration in the source area (defined as the region with TRPH concentrations greater than 100 ppm) is approximately 142 ppm based on the available groundwater measurements. Assuming that the thickness of contaminated saturated aquifer exceeding 100 ppm is approximately 5 feet, the volume of contaminated soil is approximately 55,000 cubic feet (ft^3) or, using the estimated porosity of 25 percent, 13,800 ft^3 of contaminated groundwater (see calculation in Appendix B). To reduce the TRPH concentration in this groundwater to 100 ppm, approximately 16 kilograms (kg) of hydrocarbons will have to be degraded. In addition, there is generally a significant quantity of TRPH sorbed to the soil within such contaminated areas. Assuming that there is 10 times as much TRPH sorbed to the soil within the source area, then there is approximately 180 kg of hydrocarbons in the aquifer that will have to be degraded to reduce the groundwater TRPH concentrations to less than 100 ppm and maintain them at or below that level (Appendix B).

4.2.1.2 **Oxygen and Nutrient Loading** Virtually all of the hydrocarbons found in petroleum fuel at the Alpha Delta Pier have been demonstrated to be biodegradable. Bioremediation of the dissolved hydrocarbons in the saturated soil will require delivery of a sufficient amount of oxygen to the bacteria that occur naturally in the soil. Oxygen can be delivered to the contaminated area by infiltrating water saturated with atmospheric oxygen (i.e., approximately 9 milligrams [mg] of oxygen per liter of water) or by infiltrating water containing 100 ppm hydrogen peroxide, which slowly hydrolyzes to produce 50 ppm molecular oxygen. Assuming that it is necessary to add 5 grams oxygen to biodegrade 1 gram of petroleum carbon (based on stoichiometry of 2.5:1 and a safety factor of 100 percent), then the amount of dissolved plus sorbed hydrocarbons estimated to be in the source area will require approximately 900 kg of oxygen for remediation (see Appendix B).

In addition to oxygen, a nutrient mixture (comprised of ammonia and polymeric phosphate) will be delivered to the contaminated area to supplement naturally existing nutrients in the groundwater. Nutrients will be added at a loading rate of approximately 0.65 kg of nutrients per kilogram of biodegradable carbon or a total of approximately 120 kg of nutrients.

4.2.1.3 **Water Infiltration System** Nutrient and oxygen delivery will be accomplished by flushing water through the contaminated zone using a drip irrigation system. The hydraulic conductivity of the soil is approximately 21.13 ft/day. Preliminary calculations (Appendix B) indicate that if 30,000 gallons of water per day are evenly distributed over the source area through a subsurface distribution system, the water table should rise less than 2 feet within the area. If 100 mg/ℓ hydrogen peroxide is used as the oxygen source, then approximately 180 days of infiltration will be required.

4.2.2 Perimeter Area System

4.2.2.1 **Perimeter Contaminant Mass Loading** According to the CAR (ABB, 1992), groundwater at Alpha Delta Pier presently flows at a velocity of approximately 0.6 ft/day (or a specific discharge of 0.15 ft/day) toward the east along the turning basin. The water table is found approximately 4 feet below ground surface. Assuming that:

- the water flowing toward the perimeter is contaminated throughout the top 5 feet of the water table,
- the groundwater specific discharge may increase due to the source area infiltration system or may be approximately 0.2 ft/day,
- this water contains an average TRPH concentration of 16 ppm,
- TRPH concentration must be reduced to 5 ppm, and
- the groundwater is flowing through a transect approximately 150 feet across;

then the contaminant mass loading at the perimeter of the plume area is approximately 0.05 kilogram per day. The perimeter system will also provide additional treatment for groundwater displaced by the source area treatment system prior to its migration downgradient.

4.2.2.2 **Oxygen Loading** Oxygen will be delivered to the contaminated area by addition of magnesium peroxide (Mg_2O_2), which hydrolyzes to magnesium and molecular oxygen. Assuming that there are 5 grams oxygen used to biodegrade 1 gram of petroleum carbon (including a safety factor of 100 percent), then the amount of dissolved hydrocarbons estimated to flow toward the perimeter will require approximately 0.25 kg of oxygen per day. (It is assumed that the groundwater contains sufficient mineral nutrients to promote biodegradation of this relatively low mass of petroleum hydrocarbons.)

4.2.2.3 **Perimeter System Well Placement** Oxygen will be delivered to the contaminated groundwater through decomposition of magnesium peroxide placed in a series of wells located perpendicular to the groundwater flow path. These wells will be constructed with screens that intersect the water table and extend a minimum of 5 feet below the water table. A 4-inch diameter well can accommodate approximately 14 kg of slow release magnesium peroxide suspended within a 2-inch diameter permeable membrane sock. This peroxide releases approximately 1.8 mg oxygen per gram of peroxide per day. To deliver the necessary oxygen, we will need to install dosing wells across the groundwater flow path at an interval of about one well every 5 feet (Appendix B).

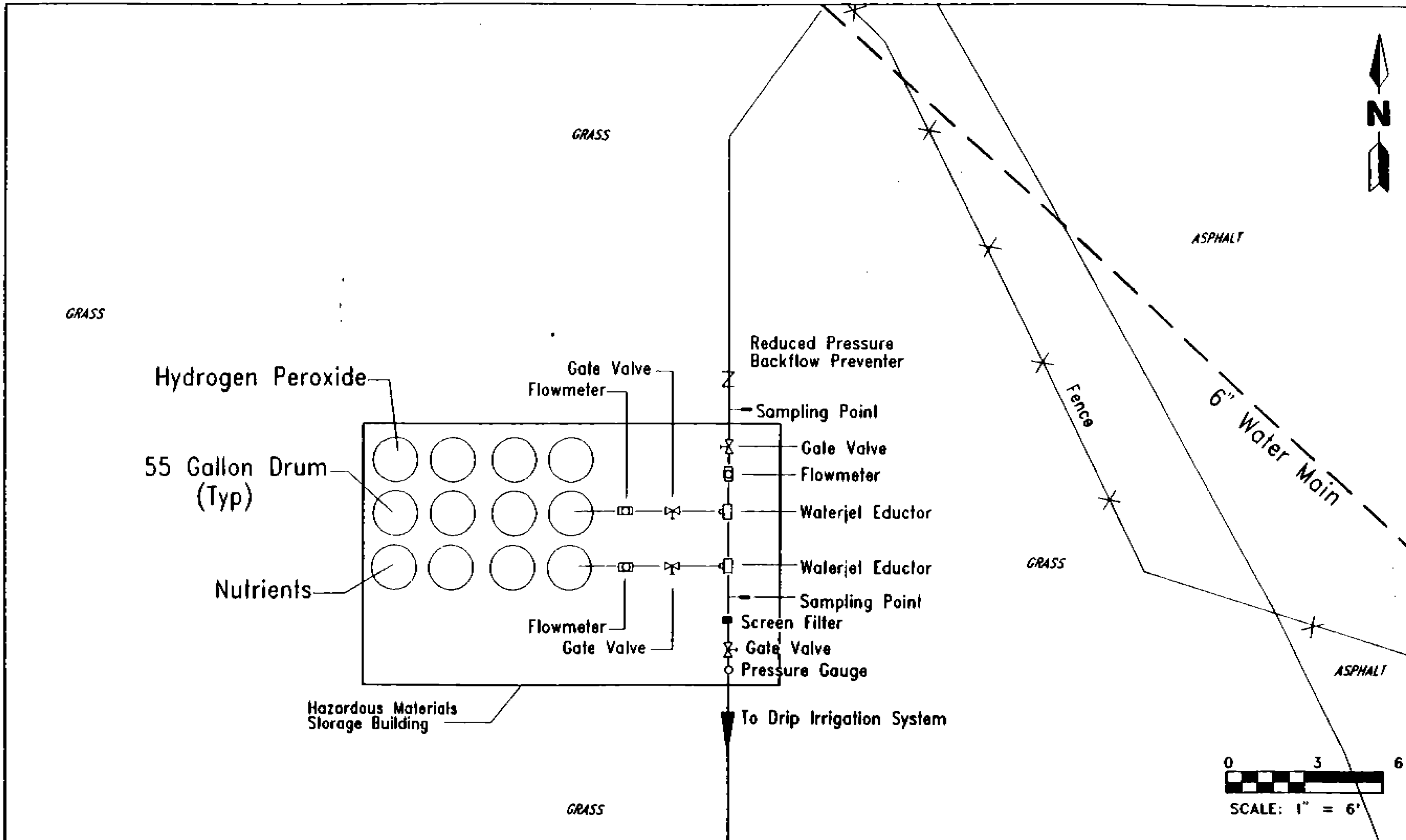
4.2.3 System Operating Parameters The considerations discussed above can be used to generate the following estimated system operating parameters. These parameters must all be verified through the startup monitoring program described in Section 4.6.

The infiltration water flow rate will be approximately 21 gpm spread evenly over the source area. Hydrogen peroxide will be added at a rate of 100 mg/ℓ to the infiltrated water. Nutrients must be added at a rate of at least 4 mg/ℓ to the infiltrated water. These concentrations are more than sufficient to satisfy the stoichiometry of the hydrocarbon degradation. However, polymeric phosphate is often needed to stabilize the peroxide that is added to the saturated soil. Therefore, it is possible that significantly more nutrients will be added to the system. We estimate that at least 25 mg/ℓ of nutrients will be added to the infiltration water.

4.3 FREE PRODUCT MONITORING AND RECOVERY. Free product has been observed in well MPT-1406-16 and in two nearby utility manholes. Although product has not been found in MPT-1406-6, TRPH analyses show contamination to be present in quantities similar to levels that might be expected in a free product area. Therefore, wells MPT-1406-6, MPT-1406-16, and the two manholes (Figure 3-1) will be monitored monthly for the presence of free product. Each location will be checked using an oil and water interface probe to measure the thickness of any product that may be present. Water from each location will be visually inspected and described. If free product is found, it will be manually bailed from the well or manhole and the volume collected will be recorded. If the measured free product thickness increases in two consecutive months, the frequency of monitoring and recovery events will be increased. Records of each monitoring event will be included in the reports described in Section 4.6. Recovered free product will be placed in appropriate containers and disposed in accordance with State and Federal requirements.

4.4 SYSTEM CONTROLS. The *in-situ* bioremedial system will be manually controlled using valves, flow meters, and pressure gauges as shown in Figure 4-4. The main valve and flow meter will be used to control the overall system flow rate. Chemical feed rates through the eductors will also be controlled by valves and flow meters. The proper operating pressure for the water distribution network will be controlled using a valve and pressure gauge.

4.5 SYSTEM STARTUP. Upon completion of construction and installation of the equipment and prior to the startup of the system, groundwater from the monitoring wells designated for monthly sampling will be collected for laboratory analysis. The system will then be started and balanced to obtain the appropriate oxygen and nutrient concentrations.



DELTPIER/KCP/12/07/93

FIGURE 4-4
TREATMENT SYSTEM

REMEDIAL ACTION PLAN

ALPHA DELTA PIER
U.S. NAVAL STATION
MAYPORT, FLORIDA

4.6 MONITORING PROGRAM. The monitoring program is designed to evaluate the performance, progress, and effectiveness of the system installed and to identify possible methods of improving the performance. The source area monitoring wells, MPT-1406-6 and MPT-1406-16, will be sampled monthly for the first year and quarterly thereafter. In addition, perimeter and background monitoring wells MPT-1406-4, MPT-1406-5, MPT-1406-7, MPT-1406-15, and MPT-1406-17 will be sampled quarterly to provide data for tracking the overall progress of the remedial program. The samples will be analyzed for site contaminants of concern as described in Section 3.1.

The *in-situ* groundwater bioremedial treatment system will require monitoring to ensure that conditions necessary to promote biological activity are maintained as well as to measure the concentration of target compounds in groundwater.

One of the primary goals of the project is to reduce total petroleum hydrocarbon (TPH) concentrations to treatment criteria. Target parameters will be monitored to evaluate the progress of the remedial process. Several additional parameters will be analyzed to monitor the biological process. The most critical factor involved with this bioremedial design is the delivery of oxygen. The perimeter oxygen delivery system will be comprised of magnesium peroxide contained in a permeable membrane sock located inside the oxygen application wells. Groundwater samples will be removed from the wells and monitored for dissolved oxygen, redox potential, pH, and iron. Data will be reviewed to look for changes as a result of oxygen delivery. A decrease in the redox will indicate that the rate of oxygen delivery is decreasing. At that point, which will be at approximately every 2 to 4 weeks, the permeable socks will be removed, visually examined, and replaced when necessary. It is anticipated that a weekly analysis schedule will be maintained for the first month of operation, then changed to a monthly schedule.

Inorganic nutrients including nitrogen and phosphorous are essential for maintaining biological activity. Results from previous analyses indicated that nitrogen and phosphate were present in the water; therefore, nutrient additions will not be required in the perimeter system. However, the concentration of nitrogen and phosphorus in the groundwater will be monitored, on a weekly basis for the first month, then monthly for the remainder of the program, to ensure that there are available nutrients as well as to monitor changes in the nutrient concentrations.

During bioremediation, it is anticipated that an increase in the bacterial population will be observed in the groundwater. The microbial populations will be monitored by enumerating total heterotrophic and hydrocarbon degrading bacteria. Samples will be removed for analysis from monitoring wells weekly for the first month, monthly for the next 6 months, and measured once a quarter for the remaining portion of the program.

The treatment water flow rates, total gallons applied, and the water pressure in the pipes will be recorded together with the water levels in all wells during each sampling event. These data will be summarized in a letter report to the Navy and FDEP after each visit.

The minimum time of cleanup to the target levels is estimated to be approximately 6 months, based on site-specific measurements and calculations as presented in Appendix B. Maximum time for cleanup is not expected to exceed 18 months depending on the actual system performance.

Presented in Table 4-1 is a summary of the recommended sampling episodes and associated tests for the first year. In addition to the sampling, the system will also be inspected during each episode and routine preventative maintenance will be performed as necessary.

Table 4-1
Sampling Schedule, First Year

Remedial Action Plan
Alpha Delta Piers
Naval Station Mayport
Mayport, Florida

Task	Month											
	1	2	3	4	5	6	7	8	9	10	11	12
Measure water levels	X	X	X	X	X	X	X	X	X	X	X	X
Measure water flow through system.	X	X	X	X	X	X	X	X	X	X	X	X
Sample perimeter and background monitoring wells[1]			X			X			X			X
Sample source area monitoring wells[2]	X	X	X	X	X	X	X	X	X	X	X	X
Sample Dosing wells[3]	XXXX	X	X	X	X	X	X	X	X	X	X	X
Measure nutrient concentrations[1,2,4]	XXXX	X	X	X	X	X	X	X	X	X	X	X
Microbiological sampling[1,2]	XXXX	X	X	X	X	X	X			X		

[1] Includes monitoring wells MPT-1406-5, MPT-1406-7, MPT-1406-15, and MPT-1406-17.
[2] Includes monitoring wells MPT-1406-6 and MPT-1406-16.
[3] Analyses include dissolved oxygen, redox potential, pH, and iron.
[4] Includes samples of potable water and oxygen/nutrient solution.

Notes: X indicates task to be performed.
XXXX indicates weekly sampling for the first month.

5.0 COST ESTIMATE

The cost estimate is inserted following Appendix B in those report copies that require it and has been omitted in others. This was done to facilitate Navy procurement requirements.

6.0 SCHEDULE

It is estimated that the necessary equipment and materials can be delivered to the site within 8 to 10 weeks of notification to the suppliers. Preparation of any necessary construction plans or permit applications should begin immediately upon notice to proceed from the Navy. The permitting procedure is expected to take approximately 4 weeks. The permits required for implementation of the RAP include construction permits issued by the local county building department. Upon acquisition of the permits, equipment, and materials, it is estimated that the system installation and startup will take approximately 4 weeks.

Prior to the implementation of the system, final construction and engineering drawings should be submitted, as necessary, along with equipment and material information for the remedial system. After the system is implemented, as-built drawings of the system should be prepared and submitted in accordance with Section 7.0.

7.0 DOCUMENTATION

An O&M manual should be provided at the time of installation and start up. The manual should provide all necessary information for the proper operation and maintenance of the system by someone other than the builder. The O&M manual should include, at a minimum, the following:

- system startup instructions;
- system shutdown instructions;
- control diagrams;
- signed and sealed "as-built" drawings;
- equipment manufacturers' product information for each system component;
- equipment warranty and guaranty information;
- equipment service and repair vendor phone numbers;
- system troubleshooting guide;
- equipment and system maintenance schedule and checklist;
- Material Safety Data Sheets for materials used or being treated;
- monitoring schedule, including sampling frequency, sampling locations, required analyses, and parameters for field measurement; and
- instructions for maintaining a site activity log.

The manual should be assembled and bound in a manner suitable for use in the field.

8.0 PROFESSIONAL REVIEW CERTIFICATION

This RAP was prepared using standard engineering practices and designs. The plan for remediating this site is based on the information collected between June 1992 and August 1993 and engineering detailed in the text and appended to this report. If conditions are determined to exist differently than those described, the undersigned professional engineer should be notified to evaluate the effects of any additional information on the design described in this report.

This RAP was developed for the Alpha-Delta Piers site, NAVSTA Mayport, Florida, and should not be construed to apply to any other site.

Celora D. Jackson
Project Engineer

Michael K. Dunaway
P.E. No. 39451
Principal Engineer

Blake Svendsen
Engineer

REFERENCES

ABB Environmental Services, Inc. (ABB-ES), 1992, Comprehensive Quality Assurance Plan: Tallahassee, Florida.

ABB-ES, 1992, Contamination Assessment Report, Alpha-Delta Pier, Naval Station, Mayport, Florida: November 1992.

ABB-ES, 1993, Contamination Assessment Report Addendum, Alpha-Delta Pier, Naval Station, Mayport, Florida: March 1993.

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APPENDIX A

LABORATORY ANALYTICAL RESULTS

UST NON-CLP DATA VALIDATION
USED OIL ANALYTICAL GROUP

PROJECT: NS Mayport - A/D Pier **DATE:** 6-21-93
PROJECT No: 7515.60 **LABORATORY:** E-W/A

Laboratory data report complete?	Y ✓	N ___	ITEM: ___
QC data report complete?	Y ✓	N ___	ITEM: ___
Holding time exceeded?	Y ✓	N ___	ITEM: 1

METALS ANALYSES (Arsenic, Cadmium, Chromium, Lead)

Was the condition of samples (filtered or unfiltered) noted on the COC?	Y ✓	N ___	
Laboratory blanks within limits?	Y ✓	N ___	ITEM: ___
Equipment blanks within limits?	Y ✓	N ___	ITEM: ___
Duplicates meet UST acceptance criteria?	Y ✓	N ___	ITEM: ___
Reported concentrations above detection limits?	Y ✓	N ___	ITEM: ___
LCS/spike control samples within limits?	Y ___	N ✓	ITEM: 2

PRIORTY POLLUTANT VOLATILE ORGANICS (including non-priority organics >10ppb): EPA Methods 624 or 5030/8240

Surrogates within limits?	Y ___	N ___	ITEM ___
Laboratory blanks within limits?	Y ___	N ___	ITEM ___
Equipment blanks within limits?	Y ___	N ___	ITEM ___
Duplicates meet UST acceptance criteria?	Y ___	N ___	ITEM ___
Reported concentrations above detection limits?	Y ___	N ___	ITEM ___
Elevated detection limits for undetected compounds of interest?	Y ___	N ___	ITEM ___

Items: 1 Holding times exceeded on MPT-1406-20 when run the second time; date received: 5-19-93, date extracted: 6-2-93.
2 MS/MSD % Rec below acceptable QC limits for lead.

Recommendations:

UST\DATAREV\USEDOIL.REV

UST NON-CLP DATA VALIDATION
USED OIL ANALYTICAL GROUP

PROJECT: NS Mayport - A/D Pier **DATE:** 6-21-93

PROJECT No: 7515.60 **LABORATORY:** E-W/A

PRIORITY POLLUTANT EXTRACTABLE ORGANICS:
EPA Methods 625, 3510/8250 or 3510/8270

	Y	N	ITEM
Surrogates within limits?		✓	1
Laboratory blanks within limits?	✓		
Equipment blanks within limits?	✓		
Duplicates meet UST acceptance criteria?	✓		
Reported concentrations above detection limits?	✓		
Elevated detection limits for undetected compounds of interest?		✓	
Laboratory blanks within limits?	✓		2

TOTAL RECOVERABLE PETROLEUM HYDROCARBONS: EPA Method 418.1

	Y	N	ITEM
Equipment blanks within limits?	✓		
Duplicates meet UST acceptance criteria?	✓		
Reported concentrations above detection limits?	✓		
Elevated detection limits for undetected compounds of interest?		✓	3

Items: 1 All surrogates were below acceptable limits for MPT-1406-20 date analyzed 5-28-93. 2 Lab contaminant, butyl benzyl phthalate, detected in MPT-1406-MW20 date analyzed
~~**Recommendations:**~~ 6-3-93. 3 Detection limits raised for MPT-~~1406~~-M4 to 5 mg/L and MPT-1406-MW7 to 25 mg/L.
4 MS/MSD Recovery → on back.

Reviewer: Nicole Pagano **Date:** 6/21/93

QA Officer: **Date:**

UST\DATAREV\USEDOIL.REV

4 (cont.)

MS / MSD Recovery

Compound	Date Received (Date Prepared)	Date Analyzed	Comment
Trichloroethene	5-20-93	5-28-93	MS above QC limits
Toluene	5-20-93	5-28-93	MS above QC limits
1,4-Dichlorobenzene	5-18-93 (5-18-93)	5-27-93	MS/MSD above QC limits
1,2,4 Trichlorobenzene	5-18-93 (5-18-93)	5-27-93	MS/MSD above QC limits
1,4-Dichlorobenzene	5-19-93 (5-19-93)	5-28-93	MS/MSD above QC limits
1,2,4 Trichlorobenzene	5-19-93 (5-19-93)	5-28-93	MS/MSD above QC limits
Acenaphthene	5-19-93 (5-19-93)	5-28-93	MSD above QC limits
Lead (furnace)	(6-1-93)	6-1-93	MS/MSD below QC limi

UST NON-CLP DATA REVIEW
FIELD INFORMATION
NEESA LEVEL E SAMPLING DATA

DATE: 6-21-93 **PROJECT:** NS Mayport - A/D Pier

PROJECT No.: 7515.60 **PROJECT MGR:** John Kaiser

TO BE FILLED IN BY PROJECT PROFESSIONAL:

1. **Total number of samples:**

	monitoring wells (soil borings)	23 MWs (2 SBs)
	duplicates (10%)	3
	trip blanks (1/VOA cooler)	2
	equipment blank (1/day)	3
	field blank (1/event)	1

2. **Were any QA problems encountered during sampling? If yes, explain below.** ______
3. **Were there any client-required deviations from standard field QA? If yes, explain below.** ______
4. **What was the source of the sample bottles?** Lab
5. **What was the sampling period?** From: 5-17-93 To: 5-19-93

TO BE FILLED IN BY THE REVIEWER:

	Y	N
1. Data set complete?	✓	
2. Are the units of measurement consistent? (for example, do all 610 results have the same units?)	✓	
3. Appropriate number of blanks collected?	✓	~~[illegible]~~
4. Appropriate number of duplicates collected?		✓
5. Complete chain of custody provided?	✓	
6. Appropriate sample preservatives indicated on COC?		✓

Explanations/Other: Appropriate duplicates collected for groundwater but no duplicates taken for soil. The COC for 6-17-93 does

~~**Recommendations:**~~ not show the trip blank sent that day. CoCs for 6-17-93 and 6-19-93 do not indicate preservatio[n]. Sample collected on 6-18-93 were shipped with the samples collected on 6-19-93.

APPENDIX B

CALCULATIONS

HEIGHT OF CAPILLARY RISE CALCULATION
NS Mayport, Alpha Delta Piers

The height of capillary rise above the saturated zone in soil can be estimated as follows (Terzaghi and Peck, 1967).

$$h_c = \frac{C}{e\, D_{10}}$$

where:
- h_c = the height of capillary rise (centimeters)
- C = an empirical constant which ranges from 0.1 to 0.5 cm^2
- e = the void ratio (dimensionless)
- D_{10} = the effective grain size (centimeters)

The void ratio is calculated from the porosity (n), estimated at 0.25 at this site, as follows.

$$e = \frac{n}{1 - n} = \frac{0.25}{1 - 0.25} = 0.3333$$

Soil at the site is described as very fine to fine grained sand. A typical grain size distribution for a fine sand (Driscoll, 1987) has a D_{10} of 0.008 cm. Using a conservative C value of 0.1 cm^2, the height of capillary rise is:

$$h_c = \frac{0.1\ cm^2}{0.3333 \times 0.008\ cm} = 37.5\ cm \approx 1.25\ ft$$

References: Driscoll, Fletcher G., 1987, Groundwater and Wells, second edition: Johnson Division, St. Paul, Minnesota, pages 410-411.

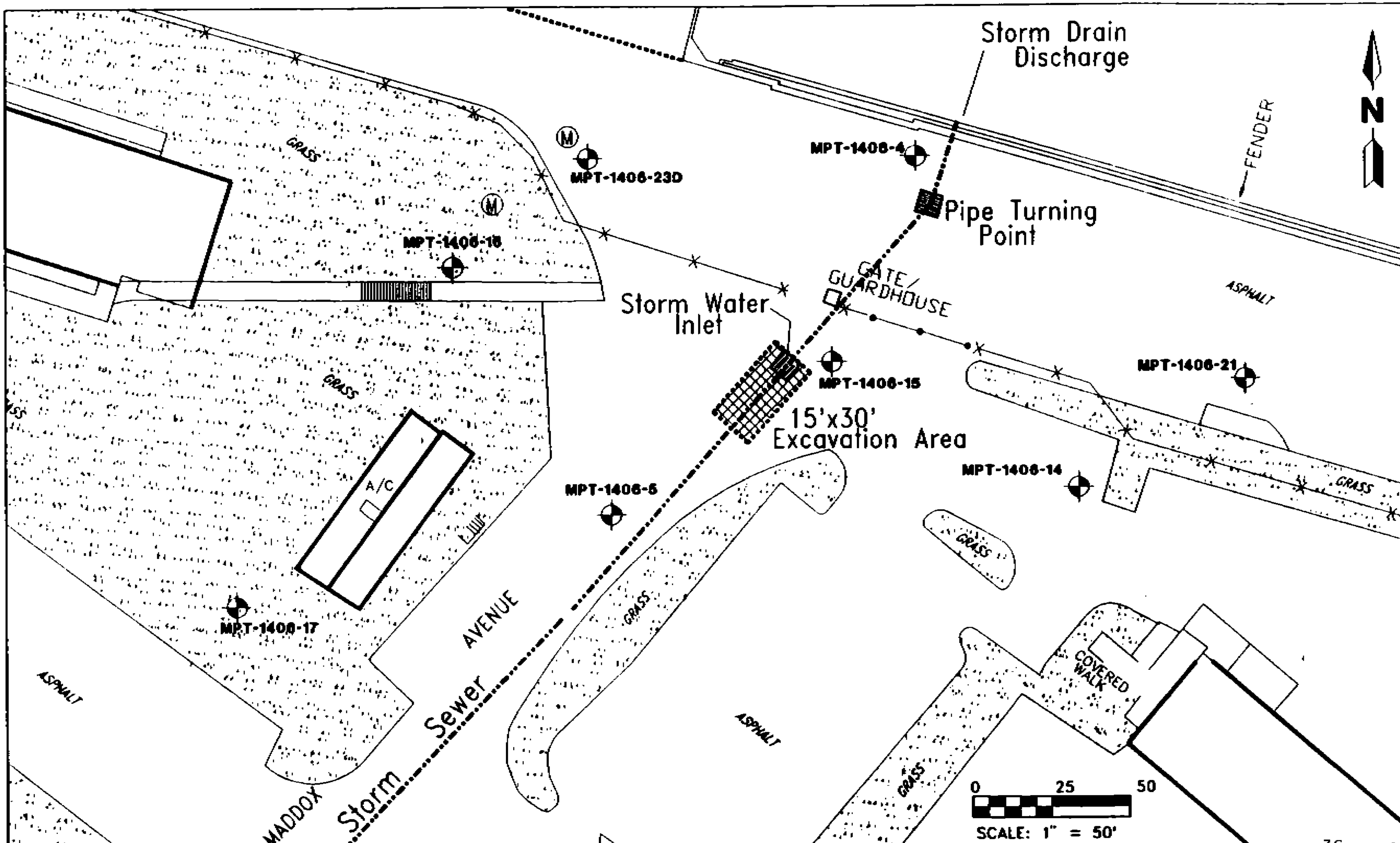
Terzaghi, Karl, and Ralph Peck, 1967, Soil Mechanics in Engineering Practice, second edition: John Wiley & Sons, New York, page 133.

STORM WATER PIPE REHABILITATION
NS Mayport, Alpha Delta Piers

The storm water drainage pipe which runs along Maddox Avenue to the Delta Pier will be rehabilitated to prevent contaminated groundwater from infiltrating and discharging to the turning basin. The proposed rehabilitation consists of installing pipe liners from the bulkhead to a point approximately 250 feet inland. The liners will have to be installed in segments because of bends, diameter changes, and structures in the existing pipe. The liners will be installed at the specified access points to minimize disruptions to ongoing activities at the pier.

The recommended liners are 20 and 24 inch diameter fiber reinforced plastic, polyethylene, or PVC with bell and spigot sleeve joints with gaskets to provide a suitable seal. Detailed construction plans and material specifications will be prepared as necessary by the specialty contractor installing the liners. To minimize excavations and disruption of site activities, it is recommended that the liners be installed from an excavation located at the storm drainage inlet near the pier gate, as shown on Figure B-1. Excavation at this point allows access to the 24 inch diameter pipe to the south and to the 30 inch diameter pipe to the north, up to the bend at the manhole. The segment from the manhole to the bulkhead can be accessed through the bulkhead, with the liner being inserted back to the manhole. The space between the existing pipe and the liner will be filled with grout and the liner will be sealed at each entrance and exit to prevent short circuiting and to protect the structural integrity of the liner.

Prior to installing the liner, the section of pipe to be lined will be cleaned to remove sediment, rocks, or debris which may have accumulated. A video inspection of the pipe will be performed to verify that the pipe will accept the liner or to identify obstructions which must be removed.



LEGEND
- Monitoring Well Location
- Manhole Location

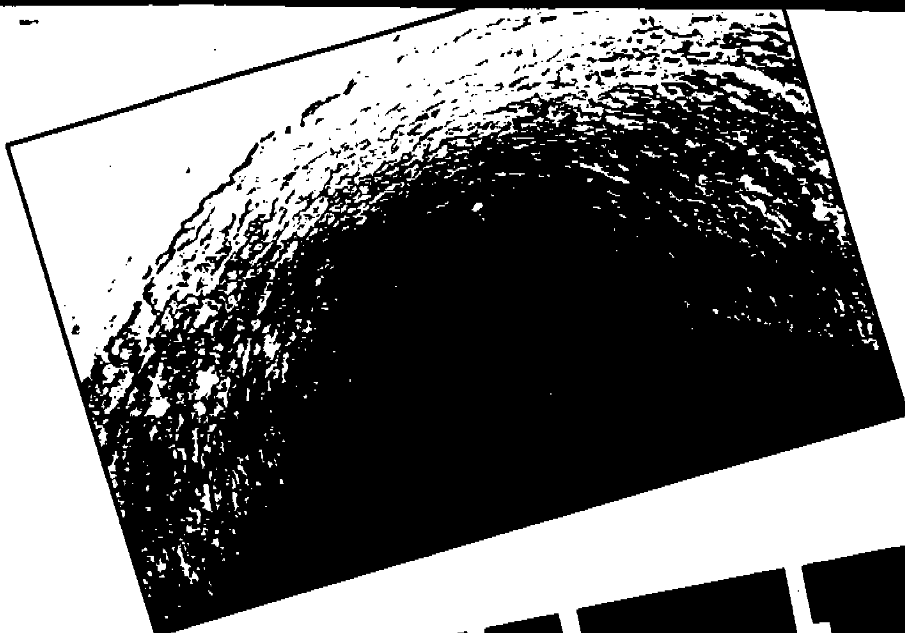
DELTPIER/KGP/12/08/93

FIGURE B-1
STORM SEWER REHABILITATION
EXCAVATION AREA

REMEDIAL ACTION PLAN

ALPHA DELTA PIER
U.S. NAVAL STATION
MAYPORT, FLORIDA

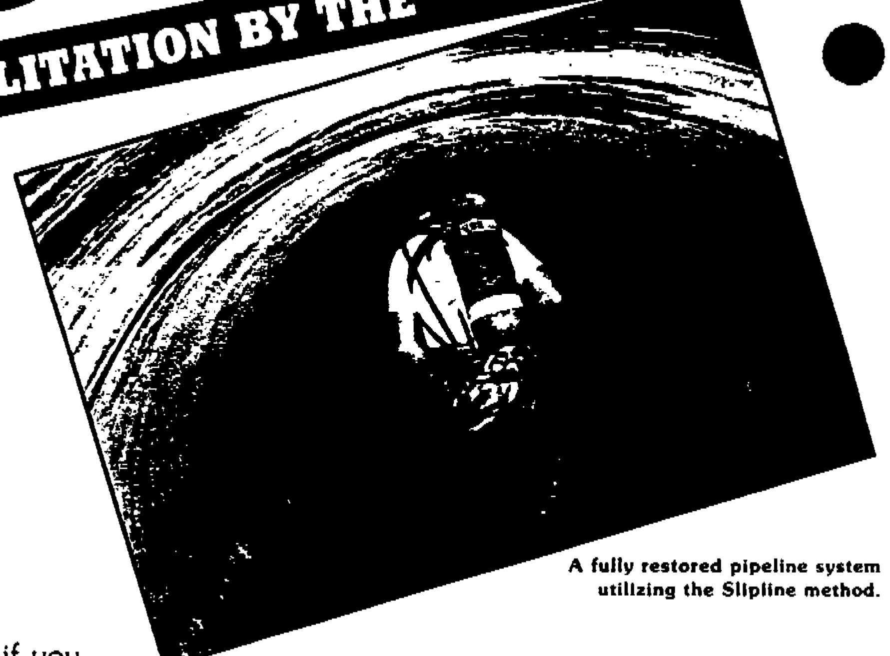
PROBLEM: PIPELINE FAILURE!



If you are experiencing deterioration of your pipeline or if infiltration is causing excess flows in your treatment system, Hall Contracting has the answer. Pipeline rehabilitation utilizing the Slipline method.

SOLUTION

REHABILITATION BY THE METHOD.



A fully restored pipeline system utilizing the Slipline method.

Consider the benefits:

In most cases sliplining is more cost efficient than total pipeline replacement. It can also be accomplished without disrupting outflows. Smooth walled polyethylene or fiberglass liners can increase hydraulic capacities and resist most corrosives that breakdown pipelines of other composition. Moreover, Hall is experienced in Sliplining pipes from 8" to 84" in diameter.

Now, everything having been considered, if you have a pipeline that needs rehabilitation or a project in the planning stage, shouldn't you call Hall?

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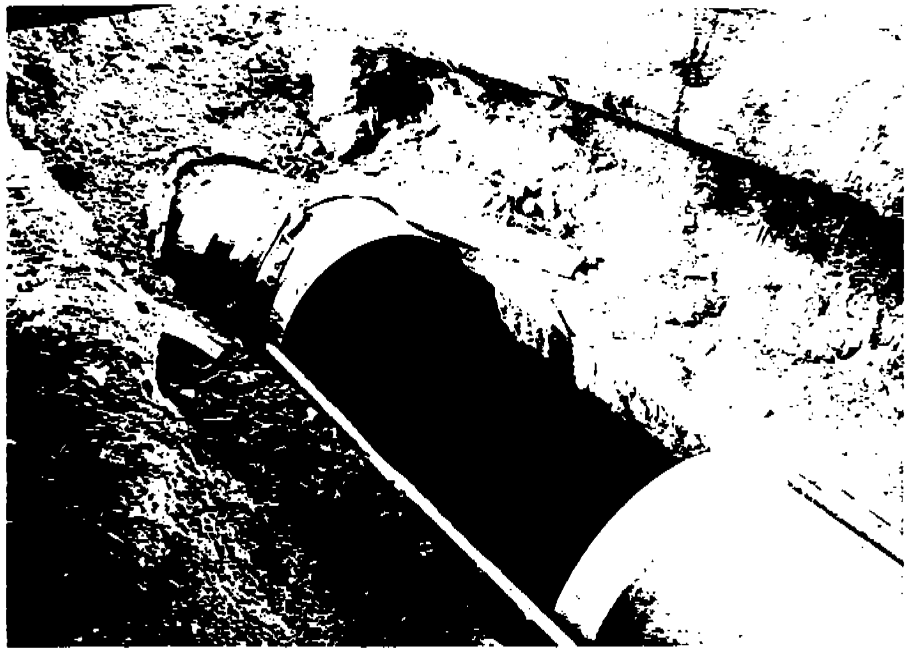
Installation

HOBAS® Liner Pipe is installed from an insertion pit normally located at a change in line direction or at some other easily accessible location. The length of the insertion pit is determined by the maximum pipe length to be used and the insertion technique selected. Pit width is determined by the diameter of the existing pipe and applicable safety regulations.

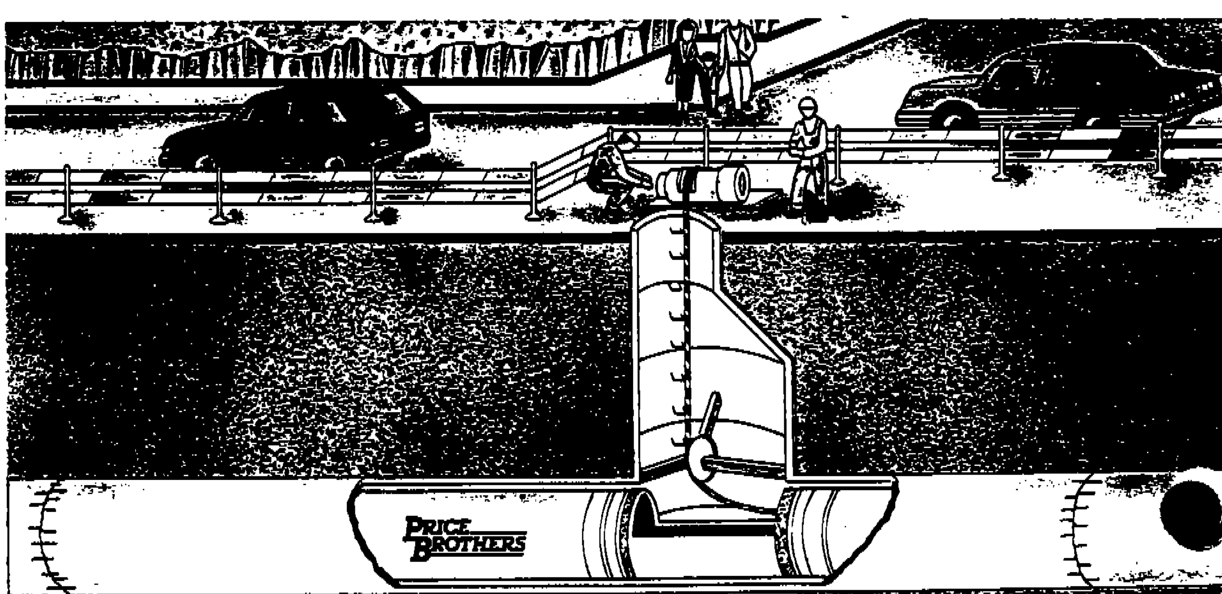
Insertion

Prior to insertion, the existing line must be thoroughly cleaned. A test pipe is then pulled through the line to insure there are no obstructions or offset joints which could impede the sliplining operation.

HOBAS Pipe is inserted spigot end first by either pushing (backhoe or jacking machine) or pulling (cable and winch system). Pipe can be joined and continually pushed or each piece pulled individually into place. Insertion is accomplished while maintaining



Unless otherwise specified, all elbows are fabricated with a radius to diameter ratio of 1.50.



flow which helps to lubricate the line. Because of its high axial strength, HOBAS® Pipe can be pushed or pulled distances in excess of 3,000 feet, depending on pipe diameter, stiffness and condition of the existing line.

After sliplining in both directions from the insertion pit, the line is closed with a prefabricated closure piece or a mechanical coupling. Prefabricated elbows can be provided for installation in the pit where there is a change in line direction.

House Connection

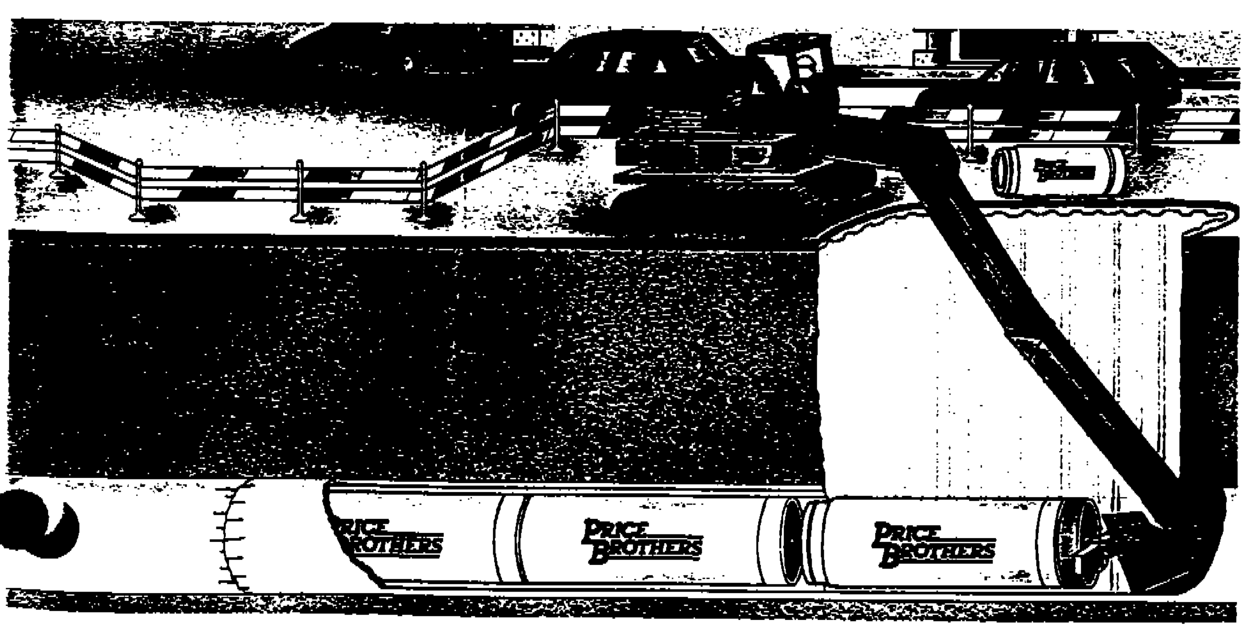
Service laterals are normally installed by excavating from ground level and connecting to the HOBAS Liner Pipe with a conventional tapping sleeve or pipe saddle. For large diameter pipe, it is sometimes possible to make a service connection from inside the liner pipe by precisely prelocating each service lateral using acceptable surveying techniques. Remote control systems for internally locating and cutting service connections may be available, depending on size and type of pipe used.

Grouting

Accepted practice is to cement grout the annular space between the liner pipe and the existing pipe to complete the structural rehabilitation of the deteriorated pipe. Grouting also protects the liner pipe from potential point loading caused by the collapse of the existing pipe.

Grout is pumped at controlled pressures from ground level through grout taps installed prior to pipe insertion, or pressure-grouted from manholes and insertion pits. A third method sometimes used with large diameter pipe is to grout from inside the pipe through threaded grout holes installed in the HOBAS Liner Pipe.

Exact specifications for grouting will vary, depending on the method used, type and capacity of equipment, and volume of the largest single continuous displacement. Neat cements or cement-fly ash grouts are commonly used with compressive strengths ranging from 500 to 3,000 psi. Grout mixes and compressive strengths will vary, depending on the condition of the old sewer, pumping distances and ground water infiltration, as well as cost and availability. Whatever grout method and mix are selected, grouting should proceed in several controlled lifts with grout pressures limited to a maximum of 5 psi.



Design Data

HOBAS® Pipe features a proven design following nationally recognized AWWA and ASTM standards. The design takes into account external dead and live loads, hydrostatic collapse resistance, jacking loads and grouting pressures. To rehabilitate a severely deteriorated and structurally unsound existing pipeline, HOBAS Pipe can be designed as a total structural replacement, assuming no structural load-carrying capability from the existing pipe.

Stiffness
Stiffness is a measure of the pipes' ability to resist external loads, external hydrostatic heads and grouting pressures. For pipeline rehabilitation, HOBAS Pipe is available in three standard stiffness classes (18, 36 and 72 psi). These standard designs allow engineers to select a pipe stiffness which will best satisfy their design conditions, i.e. condition of existing pipe, imposed loads, grout pressures and jacking distances.

Design Criteria
Pipe and fittings should be designed to withstand loadings as described below with no structural consideration given to support from the existing pipe.

- Hydrostatic Pressure—Water table should be assumed as being one (1) foot below finished grade.
- Dead and Live Loads—Soil weight and H20-44 highway loading or Cooper E80 railroad loading.
- Hydrostatic Collapse Resistance—For evaluating the pipes' hydrostatic collapse resistance due to external hydrostatic loads imposed on the pipe, the recommended calculation is:

$$P_W = \frac{24EI}{(1-\mu^2)\bullet D^3\bullet N} \quad \text{where:}$$

E = Material modulus of elasticity, psi
I = Moment of inertia of pipe wall, in.^{4}/in.
μ = Poisson's ratio
D = Mean diameter, in.
N = Safety factor (2.5 recommended)
P_W = Maximum hydrostatic pressure pipe can withstand, psi

- Buckling—Pipe should be designed to resist buckling in accordance with Appendix A of AWWA C950, utilizing a safety factor of 2.50. The buckling analysis should account for the combination of dead, live and hydrostatic loads, and a modulus of soil reaction (E′) of 2,000 psi. Liner pipe should be designed for a maximum grouting pressure of 5 psi with a safety factor of 2.50.

Hydraulic Design
A Manning's "n" of 0.009 for gravity flow applications or a Hazen-Williams "C" of 150 for pressure applications is recommended. With the HOBAS Pipe oversized internal diameter and smooth wall, it is possible to reline an existing gravity flow pipeline with no loss of hydraulic capacity.

Existing Pipe Internal Diameter "n" = 0.015	HOBAS Pipe Internal Diameter "n" = 0.009	HOBAS Capacity (%)
24"	20.8"	113
30"	24.8"	[illegible]
36"	30.8"	110
42"	36.9"	118
48"	42.9"	123
54"	49.0"	128
60"	55.0"	132
66"	60.6"	133
72"	66.7"	136
78"	72.7"	138
84"	78.7"	140
90"	84.9"	142

Note: All dimensions nominal based on 36 psi stiffness pipe.

Recommended product specification

HOBAS

PRICE BROTHERS
COMPOSITE PIPE

HOBAS Liner Pipe
Fiberglass pipe shall be manufactured in accordance with ASTM D3262, Type 1, Liner 2, Grade 3. Pipe shall be equal to HOBAS Centrifugally Cast Pipe as manufactured by Price Brothers Composite Pipe, Inc.

Pipe, fittings and special pieces shall be designed to withstand all dead and live loads, external hydrostatic pressure and grout pressures. No structural consideration is to be given to support from the existing sewer pipe. Pipe shall be designed to resist buckling in accordance with Appendix A, AWWA C950, utilizing a safety factor of 2.50. The buckling analysis shall account for the combination of dead, live and hydrostatic loads and a modulus of soil reaction (E') of 2,000 psi shall be used. Pipe shall be designed for a maximum grouting pressure of 5 psi with a safety factor of 2.50.

Pipe diameters and minimum allowable pipe stiffness shall be as shown on the project plans. Pipe stiffness shall be tested in accordance with ASTM D2412.

Pipe shall be smooth inside and out with no internal or external stiffening ribs allowed.

Pipe shall be field connected with bell and spigot sleeve joints meeting the requirements of ASTM D4161. An elastomeric gasket meeting the requirements of ASTM F477 shall be used to provide a sealing system at each joint. Maximum allowable joint deflection shall be two degrees.

Table A—HOBAS Pipe Sizes

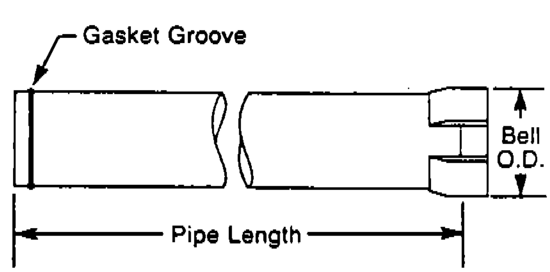
Original Pipe I.D. (in.)	HOBAS Liner Pipe			
	Nominal Diameter (in.)	Bell O.D. (in.)	Pipe I.D. (in.)	Nominal Weight (lb./ft.)
21	18	20.3	18.6	22
24	20	22.4	20.8	27
30	24	26.6	24.8	31
36	30	32.8	30.8	47
42	36	39.1	36.9	67
48	42	45.3	42.9	91
54	48	51.6	49.0	118
60	54	57.9	55.0	150
66	60	63.7	60.6	182
72	66	70.0	66.7	220
78	72	76.2	72.7	260
84	78	82.4	78.7	305
90	84	88.8	84.9	354

Note: Above dimensions and weights are nominal and subject to change based on pipe stiffness, wall thickness, pressure class and joint type.

Table B—Physical Design Values for HOBAS Pipe in Nominal Diameters from 18 Inches to 84 Inches

Gravity Pipe	**Pipe Stiffness 18, 36, 72 psi**
	Hoop flexural modulus ....1.500 to 1.670 × 10⁶ psi
	Axial tensile modulus ....0.390 to 0.630 × 10⁶ psi
	Density..............110 to 121 pounds per cubic foot
Pressure Pipe	**Pipe Stiffness 18, 36, 72 psi**
	Pressure Class 50, 100, 150, 200, 250 psi
	Hoop flexural modulus ....0.725 to 2.280 × 10⁶ psi
	Hoop tensile modulus ....0.600 to 2.750 × 10⁶ psi
	Axial tensile modulus ....0.370 to 1.640 × 10⁶ psi
	Hydrostatic design basis ....0.0070 to 0.0091 in./in.
	(HDB) Strain—50 years ....0.70 to 0.91 percent
	Density.............103 to 121 pounds per cubic foot
Gravity and Pressure Pipe	Thermal coefficient 16 × 10^{-6} inches per inch per degree Fahrenheit

Note: Design values vary, based on diameter, pipe stiffness and pressure class selected.



Price Brothers HOBAS Liner Pipe

HOBAS is the registered trade name of HOBAS Engineering and Durotec Ltd. for the centrifugally cast fiberglass pipe that Price Brothers Composite Pipe, Inc. is licensed to manufacture as HOBAS Pipe.

HOBAS

Price Brothers Composite Pipe, Inc., 367 W. Second St., P.O. Box 825, Dayton, Ohio 45401, 1-800-543-5147

Recommended product specifications

HOBAS

PRICE BROTHERS
COMPOSITE PIPE

Gravity-flow applications

Manufacture: Pipe shall be manufactured in accordance with ASTM D3262 "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer Pipe. The pipe shall meet the following cell limits: Type 1 Glass-Fiber-Reinforced thermosetting polyester resin mortar (RPMP polyester), Liner 2 Non-reinforced thermoset liner, Grade 3 Polyester resin and sand coating non-reinforced. The method of manufacture shall be centrifugal casting resulting in a controlled outside diameter. The pipe shall have a pipe stiffness as determined by the design for the project conditions. Pipe shall be HOBAS Pipe as manufactured by Price Brothers Composite Pipe, Inc. of Green Cove Springs, Florida, or approved equal.

Resin Systems: Only polyester resin systems which can be shown to be adequate for the specified project service conditions may be used.

Liner and Exterior Coating: The corrosion liner shall consist of a minimum thickness of 0.04 inches of non-reinforced polyester resin. The outside pipe coating shall have a minimum thickness of 0.03 inches and shall consist of thermosetting polyester resin and sand.

Structural Wall: The structural wall shall consist of glass fiber reinforcement, thermosetting polyester resin, and sand proportioned and oriented such that the pipe, when tested in accordance with ASTM D3262, shall meet all physical test requirements including those for the required pipe stiffness.

Joints: All joints shall be gasketed bell and spigot type or FWC coupling with elastomeric membrane meeting the requirements of ASTM D4161. Either the gaskets or elastomeric membrane shall meet the requirements of ASTM F477.

Design: The pipe shall be designed for the project burial and service conditions in accordance with Appendix A of AWWA C950 Fiberglass Pressure Pipe where applicable for a non-pressure pipe. The design shall be based on a strain analysis and the corrosion liner shall not be considered as contributing to the structural strength of the pipe.

Force-main applications

Manufacture: Pipe shall be manufactured in accordance with AWWA C950 Fiberglass Pressure Pipe. The pipe shall meet the following cell classifications: Type II Centrifugally cast, Grade 4 glass fiber reinforced polyester mortar (RPM polyester), Liner D non-reinforced thermoset liner. The pipe shall have a controlled outside diameter. The pipe shall have a pressure class and pipe stiffness as determined by the design for the project conditions. Pipe shall be Price Brothers HOBAS Pipe as manufactured by Price Brothers Composite Pipe, Inc. of Green Cove Springs, Florida, or approved equal.

Resin Systems: Only polyester resin systems which can be shown to be adequate for the specified project service conditions may be used.

Liner and Exterior Coating: The corrosion liner shall consist of a minimum thickness of 0.04 inches of non-reinforced polyester resin. The outside pipe coating shall have a minimum thickness of 0.03 inches and shall consist of thermosetting polyester resin and sand.

Structural Wall: The structural wall shall consist of glass fiber reinforcement, thermosetting polyester resin, and sand proportioned and oriented such that the pipe, when tested in accordance with AWWA C950, shall meet all physical test requirements including those for the required pressure class and pipe stiffness.

Joints: All joints shall have an exterior coupling consisting of an elastomeric membrane with dual function sealing fins on each side of a center stop with the membrane overwrapped with a filament wound glass fiber reinforcement sleeve. Restrained joints, where required, shall be recommended by the manufacturer. The elastomeric membrane shall meet the requirements of ASTM F477.

Hydrostatic Leak Tests: The manufacturer shall hydrostatically test all pipe of 54-inch diameter and smaller to twice its pressure class. Pipe with a diameter of 60 inches or greater shall be hydrostatically tested at a frequency and pressure agreed on by the pipe manufacturer and purchaser. The pipe shall not fail, leak, or weep, at the applicable sustained hydrostatic test pressure when tested at ambient temperature for at least 30 seconds. The hydrostatic test shall be conducted with end closures that do not inhibit free axial movement of the pipe. The method of testing shall simulate field assembly of the joint with an elastomeric seal used at each closure.

Design: The pipe shall be designed for the project burial and service conditions in accordance with Appendix A of AWWA C950. The design shall be based on a strain analysis and the corrosion liner shall not be considered as contributing to the structural strength of the pipe.

Table A — Height of cover table (1) (2)

	Pressure Rating											
	Gravity		50 psi		100 psi		150 psi		200 psi		250 psi	
Pipe Stiffness (psi)	Max. Cover ft.	Min. Cover ft.	Max. Cover ft.	Min. Cover ft.	Max. Cover ft.	Min. Cover ft.	Max. Cover ft.	Min. Cover ft.	Max. Cover ft.	Min. Cover ft.	Max. Cover ft.	Min. Cover ft.
18	28	3	22	2	27	2						
36	29	2	22	2	27	2	29	2	29	2		
46	29	2	22	2	27	2	29	2	30	2		
72	30	2			27	2	30	2	30	2	31	2

The above height of cover table is based on the following operating and installation conditions:

Surge pressure and operating pressure
= 1.40 x operating pressure
Vacuum pressure = 10 psi (pressure pipe only)
Weight of backfill = 120 lb/ft^3
Water table = 4 feet beneath grade
Modulus of soil reaction (E') = 1,500 psi
Deflection lag factor = 1.50 (for burial depths less than 5 feet, deflection lag factor is 2.0)
Live load = AASHTO H20-S16 Truck
Temperatures: Maximum operating =100° F
Minimum operating = 40° F
Installation = 75° F
Deflection coefficient (K_x) = 0.103
Ring bending shape factor (D_f) is:

Pipe stiffness (psi)	D_f
18	6.5
36	5.5
46	5.0
72	4.5

Notes to Table A:

(1) This table of maximum and minimum depths of cover for HOBAS Pipe was prepared in accordance with the design principles in Appendix A of AWWA C950, the operating and installation conditions shown, and the physical properties of the gravity and pressure pipe indicated. If the project operating and installation conditions vary significantly from those shown, please contact your local Price Brothers Composite Pipe representative.

(2) The maximum and minimum depths of cover can vary significantly by specifying other types of backfill soil, degree of compaction, shaped bedding, or a combination of these installation factors. For the interrelationship of the installation factors and their effect in pipe design, see Appendix A of AWWA C950.

Table B — Physical design values for HOBAS® Pipe in nominal diameters from 18 inches to 84 inches

Gravity Pipe	**pipe stiffness 18, 46, 72 psi**	
	Hoop flexural modulus	1.500 to 1.670 x 10^6 psi
	Axial tensile modulus	0.390 to 0.630 x 10^6 psi
	Density	110 to 121 pounds per cubic foot
Pressure Pipe	**pipe stiffness 18, 36, 72 psi**	
	pressure class 50, 100, 150, 200, 250 psi	
	Hoop flexural modulus	0.725 to 2.280 x 10^6
	Hoop tensile modulus	0.600 to 2.750 x 10^6
	Axial tensile modulus	0.370 to 1.640 x 10^6
	Hydrostatic design basis	0.0070 to 0.0091 inches per inch
	(HDB) Strain - 50 years	0.70 to 0.91 percent
	Density	103 to 121 pounds per cubic foot
Gravity and Pressure Pipe	Thermal coefficient 16 x 10^{-6} inches per inch per degree Fahrenheit	

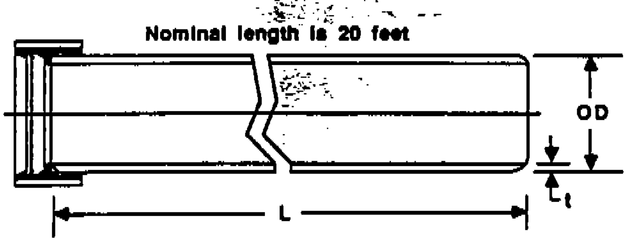
Table C — HOBAS® gravity pipe

Nom. Dia. (in.)	OD (in.)	PS = 18 psi t (in.)	PS = 18 psi wt. (lb./ft.)	PS=46 psi t (in.)	PS=46 psi wt. (lb./ft.)	PS=72 psi t (in.)	PS=72 psi wt. (lb./ft.)
18	19.5	.32	15	.42	20	.47	23
20	21.6	.35	18	.46	25	.52	28
24	25.8	.41	26	.54	35	.62	40
30	32.0	.47	36	.66	54	.75	62
36	38.3	.59	59	.77	78	.89	89
42	44.5	.67	79	.89	105	1.02	120
48	50.8	.76	102	1.01	126	1.16	156
54	57.1	.85	129	1.13	172	1.30	196
60	62.9	.93	156	1.26	208	1.43	238
66	69.2	1.02	188	1.37	252	1.57	288
72	75.4	1.14	226	1.52	302	1.74	345
78	81.6	1.23	265	1.64	353	1.88	404
84	88.0	1.32	307	1.76	410	2.02	470

Notes to Table C:
All weights and dimensions are nominal. Weight given does not include coupling.
PS = pipe stiffness at 5% deflection per ASTM D2412.

Reference Specifications:
- **ANSI/AWWA C950-88**
  Fiberglass Pressure Pipe
- **ASTM D 3262-87**
  "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Sewer Pipe
- **ASTM D 4161-86**
  "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe Joints Using Flexible Elastomeric Seals

For information and availability on diameters 72 inches through 84 inches, call us at (904) 284-3003 or write to: Price Brothers Composite Pipe, Inc., P.O. Drawer B, Green Cove Springs, Florida 32043.



Because HOBAS Pipe can be designed and manufactured to meet various stiffness and pressure requirements, it is the right choice for many deep trench gravity sewer installations.

Laboratory testing was conducted to evaluate the feasibility of using bioremediation to treat petroleum contamination in the groundwater at the Alpha Delta Pier at NS Mayport. The testing was performed by ABB Environmental Services Treatability Laboratory in Wakefield, MA.

TEST DESCRIPTION

Hydrocarbon biodegradation rates are primarily a function of oxygen and nutrient availability. Other factors that effect the rate of hydrocarbon biodegradation include the presence of petroleum degrading bacteria and the chemical nature of the petroleum contamination. The preliminary phase of the treatment simulation was designed to evaluate the microbial and chemical characteristics of site groundwater. It was necessary to establish that petroleum degrading bacteria were present in the groundwater before proceeding with further testing.

Once these parameters were established a treatment simulation test was performed to evaluate the effectiveness of using metal peroxides as a source of oxygen. The bench-scale testing was necessary since iron is present in the groundwater and anticipated chemical oxygen demand (COD) associated with iron and other inorganics could affect oxygen availability. Nutrients are also essential for biological treatment. However, the results of nutrient analysis, shown in Table B-1, indicate that trace amounts of nitrogen and phosphorus are present in site samples which may be sufficient to support biological activity. Therefore, nutrient delivery was not evaluated during the treatment simulation.

Results From Initial Analysis

Initially laboratory analysis were conducted to identify the nature of the petroleum contamination by generating a gas chromatograph fingerprint of the contamination in the groundwater. The fingerprint is a visual profile of the petroleum hydrocarbons which is compared to known standards to characterize the contamination type. Upon visual inspection of the fingerprint, it was determined that the petroleum contamination is characteristic of very weathered diesel fuel or #2 fuel oil. The petroleum fingerprint of the groundwater is shown in Figure B-5.

The groundwater samples were also analyzed for heterotrophic bacteria. Both total heterotrophic bacteria and specific petroleum degrading heterotrophic bacterial populations were enumerated to determine if indigenous groundwater bacteria were present to support biological activity. The results shown in Table B-2 indicate that a healthy population of bacteria, including petroleum degraders, are present in site groundwater.

Treatment Simulation Test Description and Results.

Laboratory testing was conducted to measure oxygen delivery using magnesium peroxide. These tests were conducted on groundwater from the site under simulated site conditions. Oxygen delivery was accomplished using metal peroxides that slowly release hydrogen peroxide into the groundwater. The hydrogen peroxide breaks down into oxygen and water. A vendor provided ABB with two samples of magnesium peroxides in solid form (powder).

An initial screening test was conducted to evaluate the rate of oxygen release from each of the two peroxides. The test was conducted using glass serum bottles containing groundwater from monitoring well 16 (MW-16) and magnesium peroxide. The bottles were air-tight, sealed with silicon-faced septa and placed on an automatic shaker. The two types of peroxide, type F and type B, were evaluated at two different concentrations. A summary of the test conditions are shown in Table B-3. The dissolved oxygen in the groundwater was measured following 24, 48 and 120 hours of incubation. Peroxide type F released oxygen much faster than type B in the test period. The dissolved oxygen results are shown in Table B-4 and Figure B-3. In addition, cumulative dissolved oxygen released per gram of metal peroxide is shown graphically in Figure B-4. Based on these results, the magnesium peroxide F was chosen for treatment simulation testing.

Treatment Simulation Test Apparatus. A column test was conducted in order to measure oxygen delivery using metal peroxides. The test apparatus, diagramed in Figure B-2, consisted of a one inch diameter glass column filled with site soil and groundwater, a peristaltic pump to facilitate groundwater flow through the column, and influent and effluent groundwater reservoirs. A glass vessel was placed in line which contained 20 gms of type F magnesium peroxide held within a permeable sock. The groundwater flow was set at 1.3 ml/min to simulate site conditions. The treatment simulation test was conducted using a composite of groundwater from monitoring wells 14 and 16 and was operated continuously for 3 days. An adequate volume of groundwater was available so that recirculation of the groundwater was not required. During the test period, groundwater samples were collected from 3 ports: the groundwater reservoir, the column influent sampling port which was located in line following the peroxide vessel, and the column effluent.

Following 24 hours, headspace gas had built up in the peroxide vessel. Since the system was air tight, it was assumed that dissolved oxygen produced from the peroxide was coming out of solution which forced dissolved nitrogen to vaporize from the groundwater as the system reached equilibrium with the atmosphere. As the dissolved gas came out of solution, the groundwater in the peroxide chamber was displaced. An additional sampling port was installed in the peroxide vessel to measure the make up of the headspace. Analysis of the headspace gas by a thermal conductivity detector revealed that the gas was comprised of approximately 30% oxygen and 70% nitrogen. The headspace gas in the peroxide vessel had to be displaced several times during the treatment simulation test period to keep the peroxide membrane saturated with groundwater. The results of the dissolved oxygen measurements taken during the test are outlined in Table B-5.

CONCLUSIONS

Results from initial analysis indicate that bioremediation should be considered to reduce the concentration of TRPH in groundwater at the Alpha Delta Pier site. Results indicted that hydrocarbon bacteria are present in the groundwater and that the type of fuel present appears to be characteristic of weathered diesel or #2 fuel, which is biodegradable. The pH of the water was found to be acceptable for biological treatment. Mineral nutrients were measured in groundwater and site soil. Based on those results ABB-ES is not recommending adding nutrients. Data indicates that there may be sufficient nutrients present in the groundwater to support bioremediation. The only limiting factor appears to be oxygen concentrations.

The results from the laboratory testing designed to evaluate oxygen delivery systems using magnesium peroxide indicated that this approach is feasible at the Alpha Delta Pier Site. The maximum amount of oxygen that can be delivered to the groundwater was approximately 20 mg/l, based on results from the screening test. Results from the column test indicate that a constant level of 10 mg/l oxygen was delivered. The concentration of the oxygen in the groundwater was lower in the column test because of the losses of the oxygen to the gas phase.

ABB-ES is recommending using the magnesium peroxide to deliver oxygen as part of the remediation process designed to reduce the concentration of TRPH along the perimeter.

Table B-1
Preliminary Analysis
Inorganic Nutrients and pH in Soil

Remedial Action Plan
Alpha Delta Pier
Mayport Naval Station
Mayport, Florida

Sample I.D.	Total Kjeldahl Nitrogen	Ammonia Nitrogen	Nitrate Nitrogen	Phosphate Phosphorous	Total Phosphorous	pH
Site Soil (mg/kg)	N/A	<5	1.3	N/A	10	7.5[1]
Site Groundwater (MTP-1406-MW6) (mg/L)	7.8[2]	1.4[2]	<0.05[2]	<0.05[2]	N/A	7.0

Notes:
N/A = Not analyzed
[1] = Measured using a site soil and groundwater slurry
[2] = Based on previous site data from Enseco

Table B-2
Preliminary Analysis
Bacteria in Groundwater

Remedial Action Plan
Alpha Delta Pier
Mayport Naval Station
Mayport, Florida

Sample I.D.	Colony Forming Units /mℓ	
	Total Heterotrophic Bacteria	Specific Petroleum Degrading Bacteria
MW - 14	43	1.3
MW - 16	270	16

Table B-3
Peroxide Evaluation - Initial Screening Test for Metal Peroxide Oxygen Release
Summary of Test Conditions

Remedial Action Plan
Alpha Delta Pier
Mayport Naval Station
Mayport, Florida

Test Condition	Site Groundwater	Magnesium Peroxide	
		Type F	Type B
1 (control)	40 mℓ	0.0	0.0g
2	40 mℓ	0.125g	0.0g
3	40 mℓ	0.250g	0.0g
4	40 mℓ	0.0g	0.250g
5	40 mℓ	0.0g	0.500g

Table B-4
Peroxide Evaluation - Initial Screening Test for Metal Peroxide Oxygen Release
Dissolved Oxygen (mg/L)

Remedial Action Plan
Alpha Delta Pier
Mayport Naval Station
Mayport, Florida

Test Condition	t = 24 hours	t = 48 hours	t = 120 hours
1 (control)	1.3	0.6	1.0
2	4.4	7.0	10.9
3	6.8	11.4	19.1
4	1.7	4.4	4.1
5	1.7	5.1	4.8

Values reported are average of Duplicates.

Table B-5
Peroxide Evaluation - Treatment Simulation for Metal Peroxide Oxygen Release
Dissolved Oxygen (mg/L)

Remedial Action Plan
Alpha Delta Pier
Mayport Naval Station
Mayport, Florida

Time in Hours	Groundwater Reservoir	Column Influent	Column Effluent
0	1.6	7.1	4.3
1.5	--	--	4.7
2.8	1.5	3.6	--
4.0	--	--	4.6
4.5	--	4.9	--
5.1	1.3	--	--
5.5	--	--	4.8
22.8	1.2	--	--
23.0	--	--	10.0
24.0	--	8.2	--
26.0	--	--	9.2
27.5	1.4	--	--
28.0	--	10.1	--
30.0	--	--	8.0
30.5	--	11.0	--
40.0	0.8	--	--

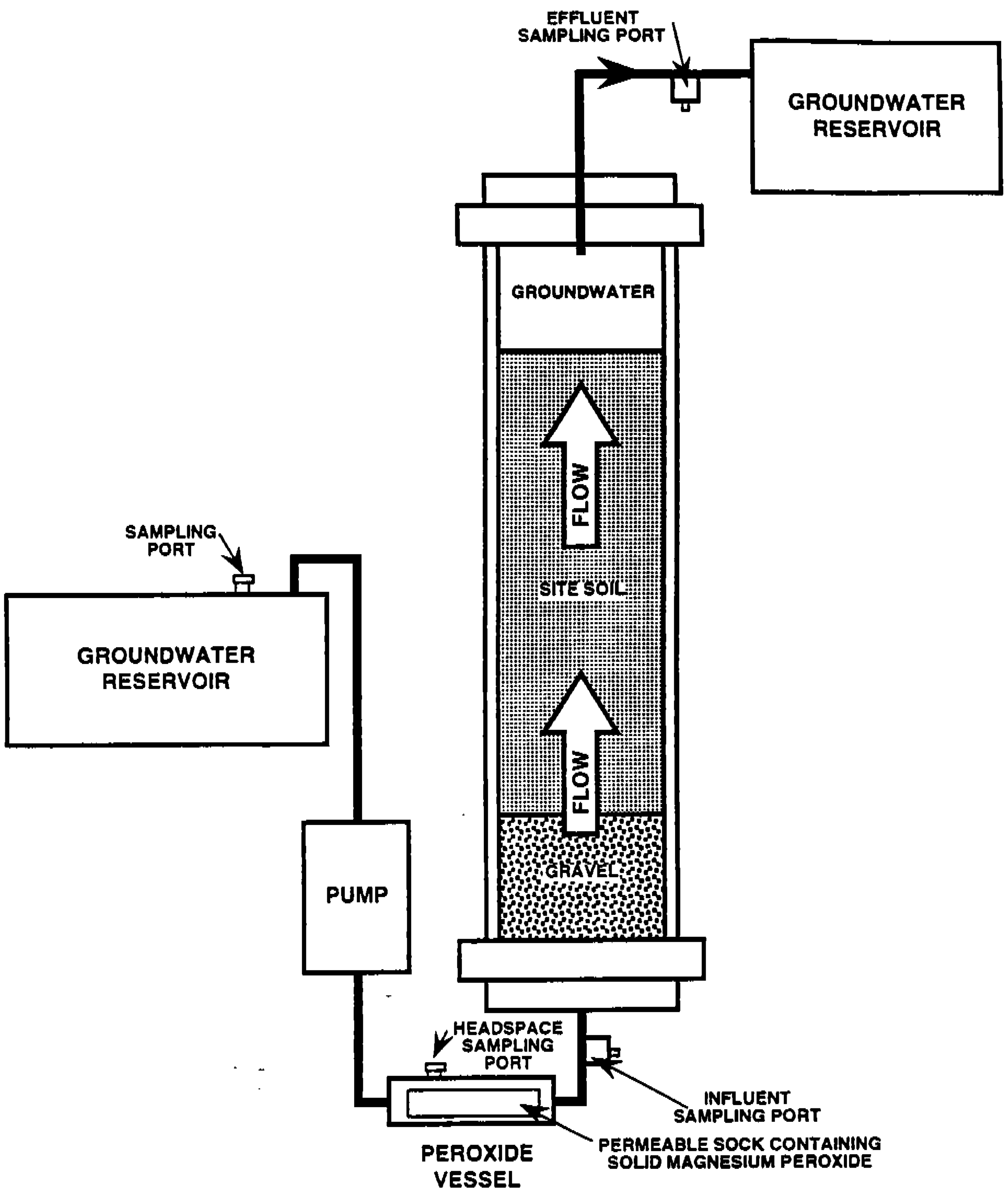


FIGURE B-2

PEROXIDE TREATMENT SIMULATION - COLUMN SCHEMATIC

REMEDIAL ACTION PLAN
NAVY EXCHANGE FILLING STATION

ALPHA DELTA PIER
U.S. NAVAL STATION
MAYPORT, FLORIDA

7515-60 931028WEM

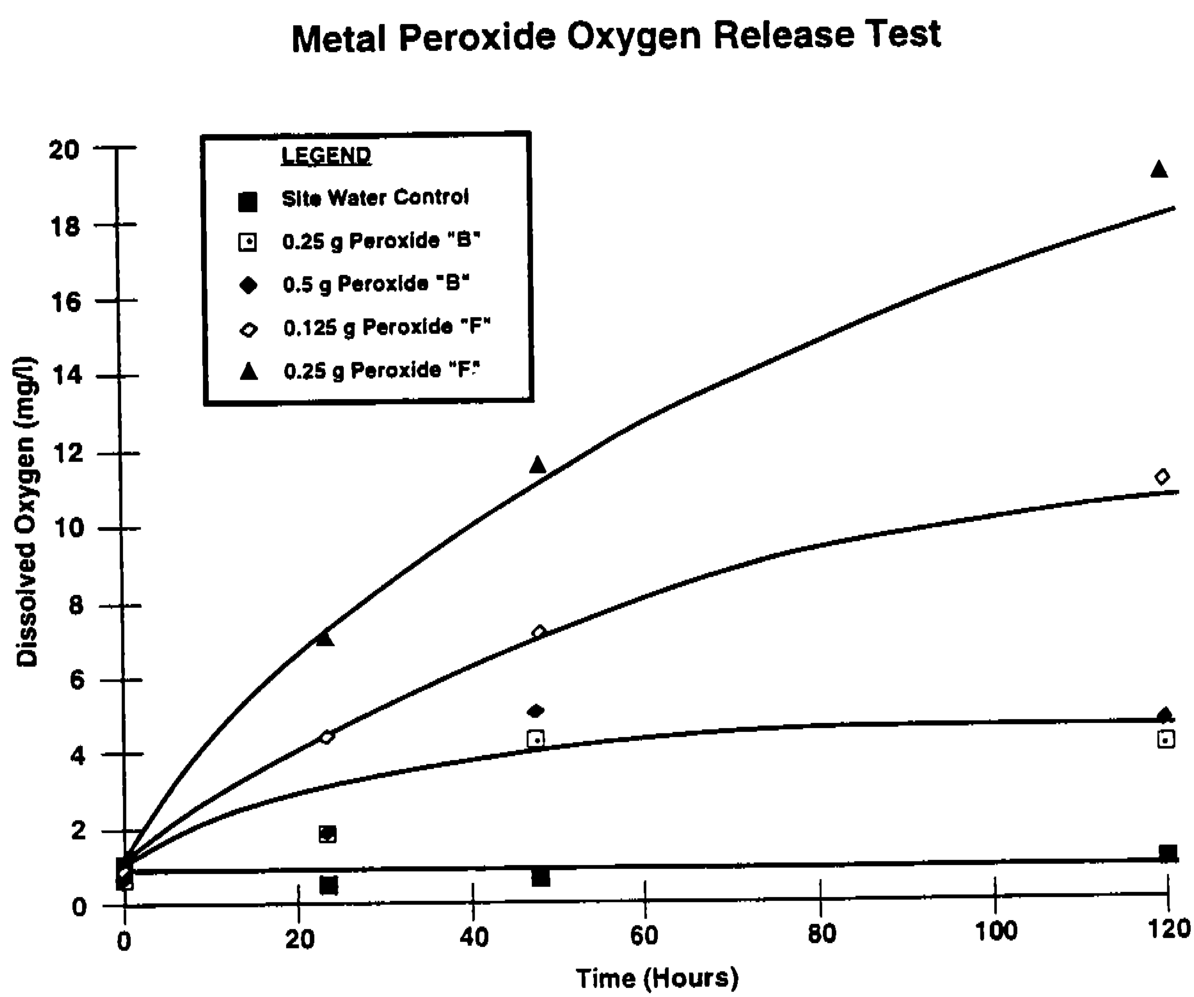


FIGURE B-3

METAL PEROXIDE OXYGEN RELEASE TEST:
OXYGEN MEASUREMENTS

REMEDIAL ACTION PLAN
NAVY EXCHANGE FILLING STATION

ALPHA DELTA PIER
U.S. NAVAL STATION
MAYPORT, FLORIDA

7515-60 931028WEM

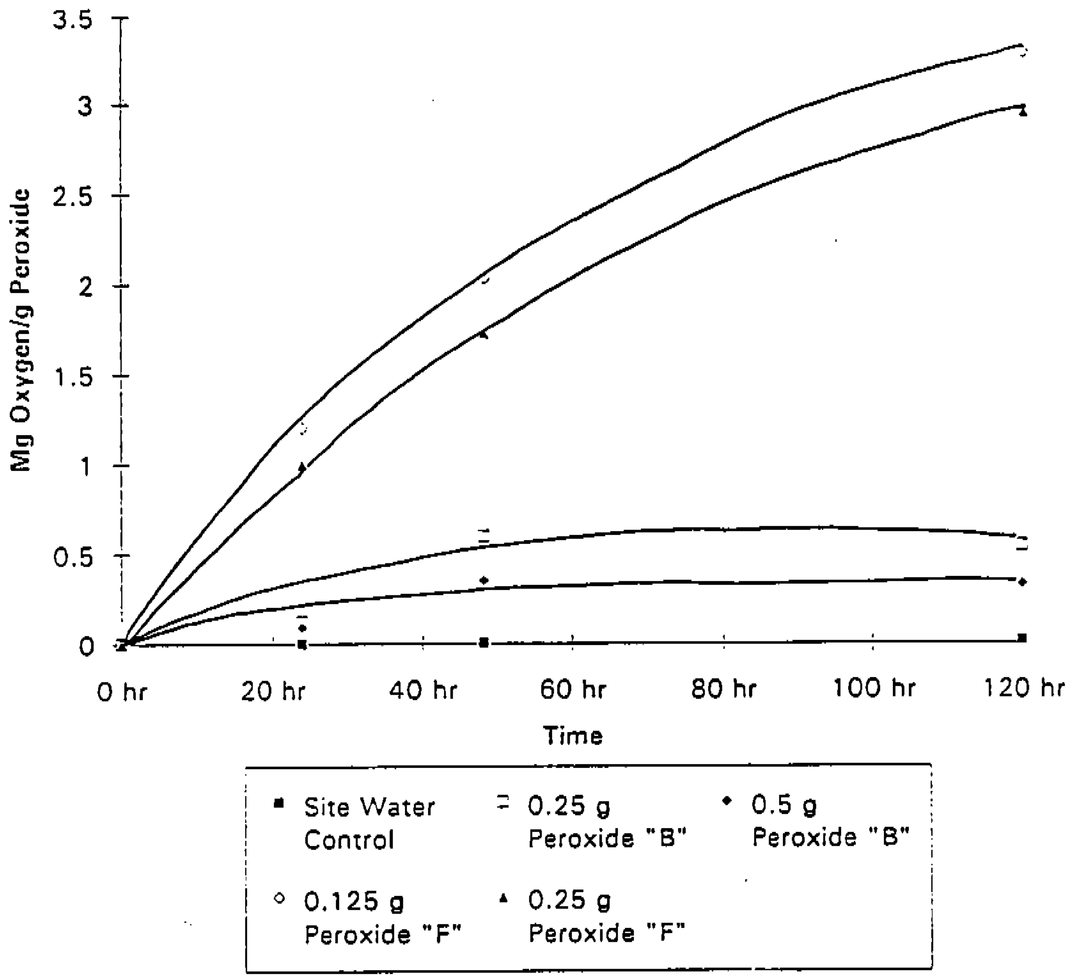


FIGURE B-4

METAL PEROXIDE OXYGEN RELEASE TEST: CUMULATIVE OXYGEN RELEASED PER GRAM OF PEROXIDE

REMEDIAL ACTION PLAN
NAVY EXCHANGE FILLING STATION

ALPHA DELTA PIER
U.S. NAVAL STATION
MAYPORT, FLORIDA

7515-60 931028WEM

PETROLEUM FINGERPRINT

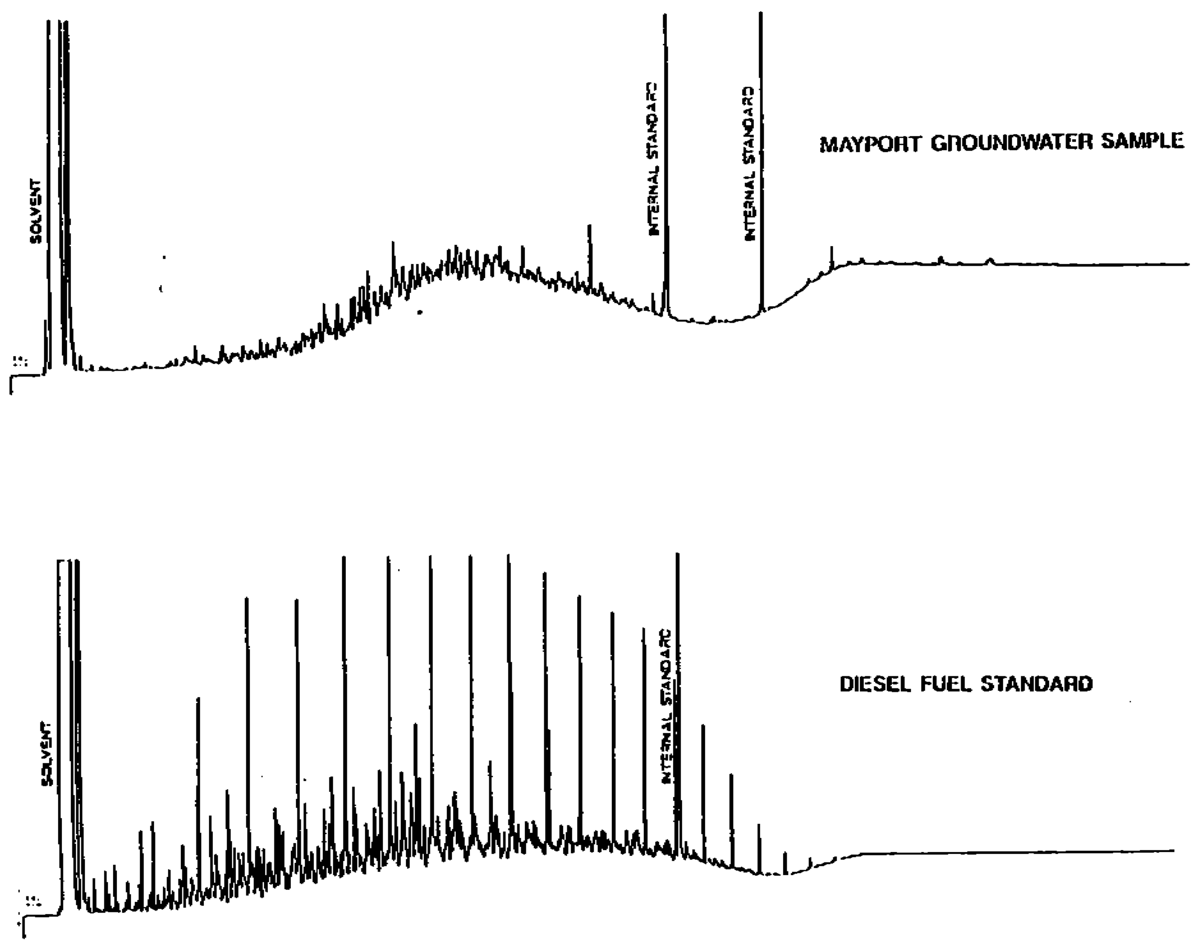


FIGURE B-5

PETROLEUM FINGERPRINT

REMEDIAL ACTION PLAN
NAVY EXCHANGE FILLING STATION

ALPHA DELTA PIER
U.S. NAVAL STATION
MAYPORT, FLORIDA

7515-60 931028WEM

Oxygen and nutrients will be delivered to the source area to promote the bioremediation of the contaminated groundwater. Hydrogen peroxide will be delivered at a concentration of approximately 100 ppm. To achieve this concentration, approximately 9.3 gallons per day of 30 % H_2O_2 will be mixed into the 30,000 gpd water flow. For oxygen consumption related calculations, a safety factor of 2 will be applied and the design concentration will be 50 ppm. Concentrated mixtures of nitrogen and phosphorus will also be delivered to the source area through the water flow to supplement the naturally occurring nutrients. The design system flow rate was based on estimated groundwater movements which would result from the mound formed when the flow was applied. It is estimated that the hydraulic gradient in the vicinity of the source area can be increased to about 2.1 feet per 100 feet. Using the site hydraulic conductivity of 21.13 ft/day and a porosity of 0.25, the induced groundwater pore velocity will be:

$$V = \frac{I \times K}{\eta} = \frac{0.021\ \frac{ft}{ft} \times 21.13\ \frac{ft}{day}}{0.25} = 1.8\ \frac{ft}{day}$$

Assuming the target contaminant concentrations occur in the upper 5 feet of the aquifer and that the perimeter of the source area is approximately 420 feet, the daily flow through rate would be:

$$5\ ft \times 420\ ft \times 1.8\ \frac{ft}{day} = 3780\ \frac{ft^3}{day} \approx 28{,}300\ gpd$$

Rounding to 30,000 gpd and delivering 50 mg/ℓ, the oxygen delivery rate will be:

$$30{,}000\ gpd \times 3.785\ \frac{l}{gal} \times 50\ \frac{mg\ of\ O_2}{l} \times 0.001\ \frac{mg}{g} = 5677.5\ \frac{g\ of\ O_2}{day} = 13\ \frac{lb\ of\ O_2}{day}$$

Using areas of concentrations as shown on Figure 3-2 and a thickness of contaminated aquifer of 5 feet, the volume between the 100 ppm and 160 ppm contours is 29639.5 ft^3 and the volume inside the 160 ppm contour is 25695.5 ft^3. The geometric average TRPH concentration between the 100 ppm and 160 ppm contours is:

$$\sqrt{100\ ppm \times 160\ ppm} = 126\ ppm$$

The average concentration within the 100 ppm contour, including the 160 ppm contour, is:

$$\frac{(126\ ppm \times 29639.5\ ft^3) + (160\ ppm \times 25695.5\ ft^3)}{(29639.5\ ft^3 + 25695.5\ ft^3)} = 142\ ppm$$

The O_2 required to reduce the TRPH concentrations in groundwater from 142 ppm to 100 ppm is:

$$(142\ ppm - 100\ ppm) \times (29689.5\ ft^3 + 25695.5\ ft^3) \times 0.25 \times 28\ \frac{l}{ft^3} = 16{,}283$$

$$16{,}283\ g\ of\ TRPH \times 2.5\ \frac{g\ of\ O_2}{g\ of\ TRPH} = 40{,}708\ g\ of\ O_2$$

Assuming there is 10 times as much TRPH sorbed to the saturated soil as there is dissolved in the groundwater, the total mass of TRPH to be degraded is 179 kg, and will require approximately 450 kg of O_2. The proposed delivery system can provide 5.68 kg of O_2 per day. Therefore, the TRPH concentrations can theoretically be reduced to the target level in:

$$\frac{450\ kg\ of\ O_2}{5.68\ \frac{kg\ of\ O_2}{day}} = 80\ days$$

Applying a safety factor of two for planning purposes, remediation to the target levels is expected to be complete in approximately 160 days.

Degussa

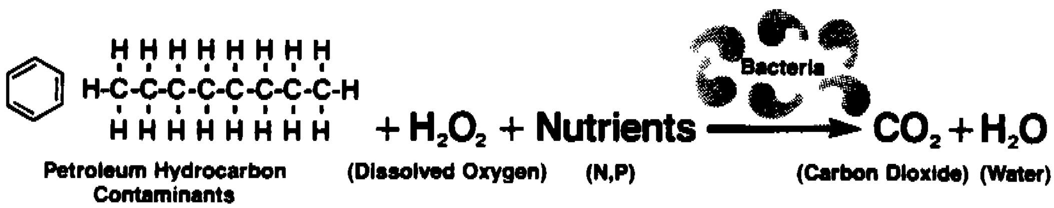
Degussa
Corporation

In Cooperation With
Bioremediation Systems
A Division of Cambridge Analytical Associates
P.O. Box 7109, Princeton, NJ 08543

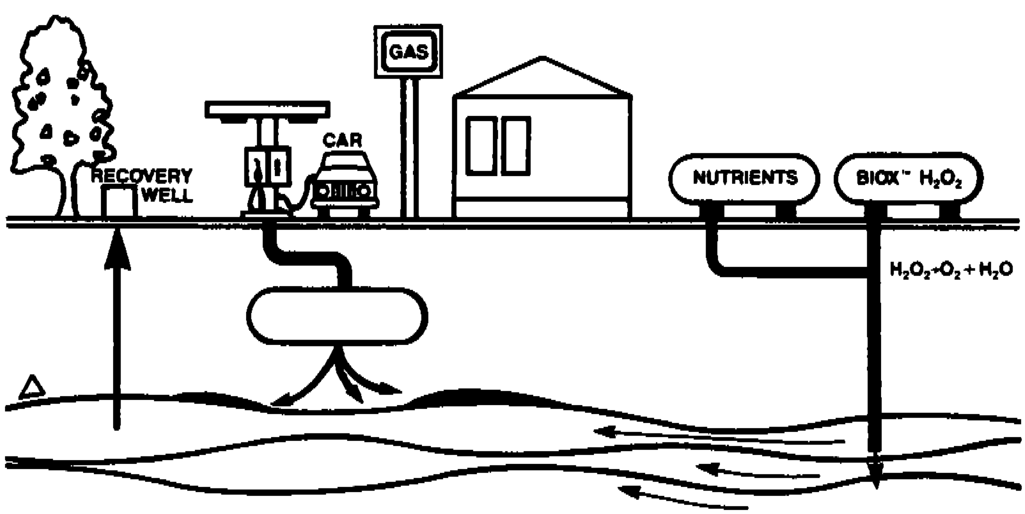
Enhanced Biodegradation

- Leaking petroleum storage tanks
- Contaminated soils, sludges, and lagoons
- Contaminated aquifers

Technology has now been developed which uses naturally occurring bacteria to degrade petroleum hydrocarbons. **Cambridge Analytical Associates Bioremediation Systems Division** has refined this technology for the enhanced biodegradation of these contaminants. Critical to this process is BIOX,™ a specially formulated and stabilized solution of **hydrogen peroxide.**



Bacteria are tiny living organisms which need nutrients to thrive. Oxygen is an essential nutrient which until now, was almost always the limiting factor for rapid microbial population growth and rapid biodegradation of hydrocarbons. Now however, **hydrogen peroxide** can provide up to 500 ppm of molecular oxygen to these microbes, compared to a maximum of only 10 ppm provided by other means of oxygen transfer. **Hydrogen peroxide** is a liquid solution completely miscible in water.



The water source for the oxygen/nutrient delivery system will be the NS Mayport potable water system. Connection will be made to the existing 6-inch water main. A reduced pressure type backflow preventer, suitable for use in high hazard cross-connection situations, will be installed prior to any other treatment equipment. The recommended backflow preventer is a Watts 009QT Series model 009-S-SS. The backflow preventer should meet all requirements of the cross connection control program for the NS Mayport potable water distribution system.

A gate valve and flow meter will be located after the backflow preventer to allow control of the overall system discharge rate. These will be followed by a water jet eductor which will feed in the hydrogen peroxide solution. A second eductor will feed in the nutrient solution. The recommended eductors are Ketema model 264 PVC. Each suction line to the eductors will be equipped with a gate valve and flow meter to control and measure the oxygen and nutrient solution influents. If insufficient water pressure is available to operate two eductors, consideration should be given to combining the influents using a single eductor or an alternate feed system.

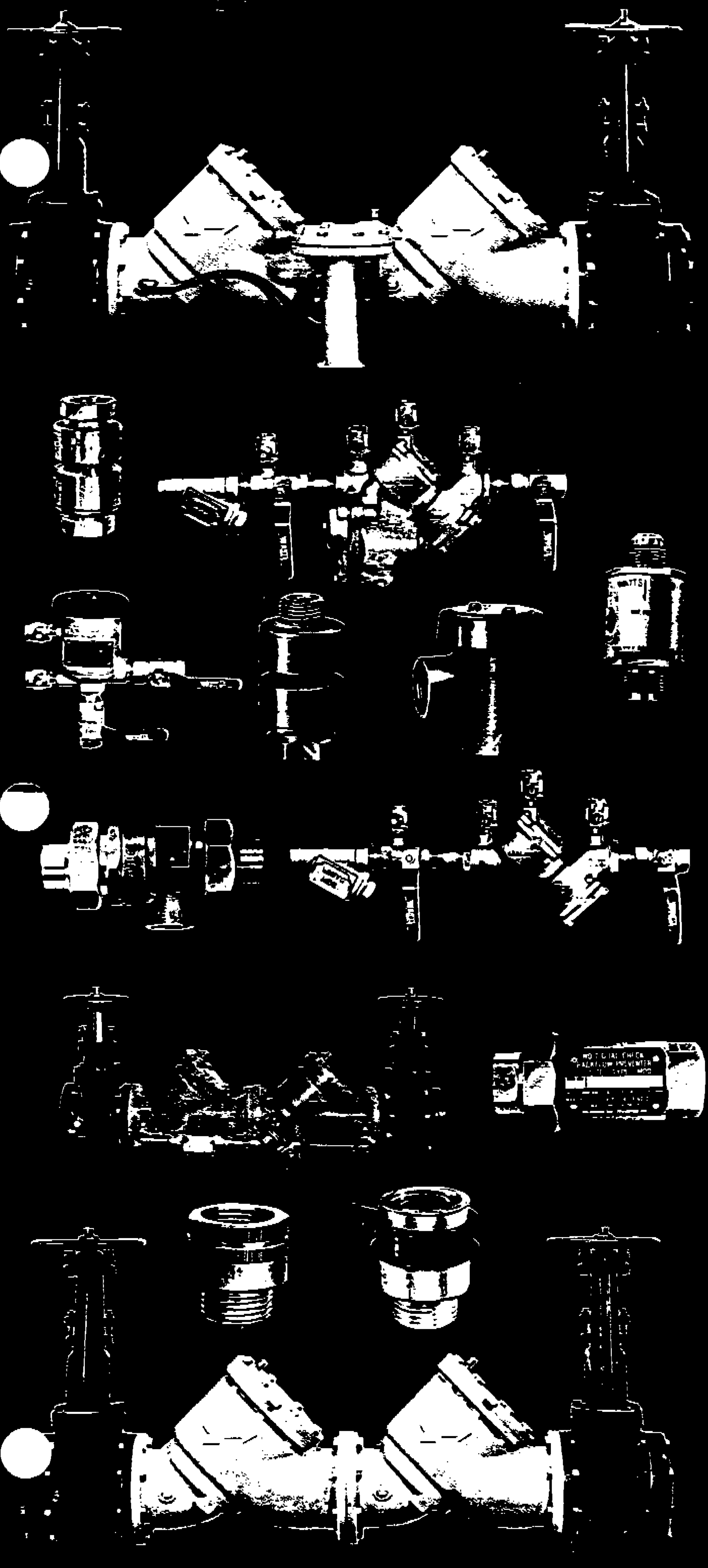
The oxygen/nutrient solution will be distributed over the source area using a drip irrigation system. The distribution system will begin with a screen filter to remove any particles which may be present. This will be followed by a gate valve and pressure gauge which will be used to maintain the proper operating pressure within the distribution lines. The solution will flow through a schedule 80 PVC header to the drip tubing laterals. The header should be sized to minimize head losses and to maintain an even distribution pressure. The header and drip tubing will be installed underground, sufficiently deep to protect the system and to allow proper repair of the pavement. The tubing will be installed in lateral trenches spaced at intervals of approximately 10 feet. A total length of approximately 1125 feet of trenching will be required to cover the source area. Assuming an application rate of 30,000 gpd, the required flow per 100 feet of tubing is:

$$\textit{Flow per } 100 \textit{ ft} = \frac{30{,}000 \textit{ gpd} \times 100 \textit{ ft}}{24 \frac{hrs}{day} \times 60 \frac{min}{hr} \times 1125 \textit{ ft}} = 1.85 \frac{gpm}{100 \textit{ ft}}$$

To accommodate the required flow rate, multiple runs of drip tubing will be installed in each trench. The recommended tubing is Ro-Drip 10 mil tubing with 8-inch emitter spacing (part number 010-910840), which can discharge 0.67 gpm/100 feet. Therefore, three runs of drip tubing will be needed in each trench to deliver the required flow.

The piping, controls, and feed chemicals for the system will be housed in a prefabricated storage building equipped with lighting, ventilation, fiber glass grating, and a sump liner. The recommended building is the Safety Storage model 15. The building should be set up on wooden cross-ties if the soil at the proposed location does not provide a satisfactory foundation.

C-BPD-20



"The Complete Concept in Cross Connection Control and Containment"

BACKFLOW PREVENTION DEVICES

World Class Valves

WATTS REGULATOR

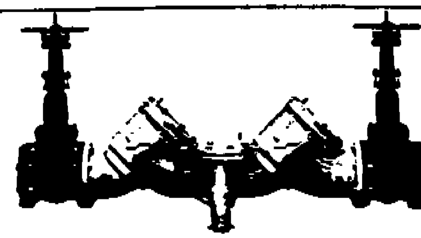
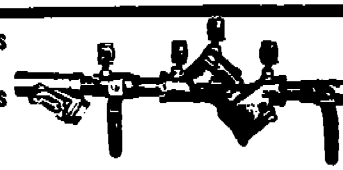
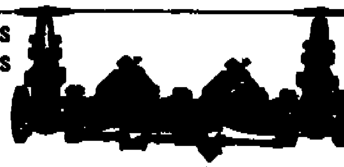
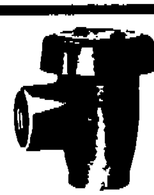
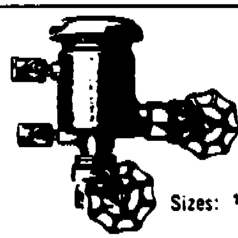
Since 1874

FOUR BASIC TYPES OF BACKFLOW PREVENTERS

	TYPE & PURPOSE	DESCRIPTION	INSTALLED AT	EXAMPLES of INSTALLATIONS
1	**REDUCED PRESSURE ZONE BACKFLOW PREVENTER** *For high hazard cross connections and continuous pressure applications.*	Two independent check valves with intermediate relief valve. Supplied with shut-off valves and ball type test cocks.	All cross connections subject to backpressure or back-siphonage where there is a high potential health hazard from contamination. Continuous pressure.	Main Supply Lines Commercial Boilers Cooling Towers Hospital Equipment Processing Tanks Laboratory Equipment Waste Digesters Car Wash Sewerage Treatment
2	**DOUBLE CHECK VALVE ASSEMBLY** *For low hazard cross connections and continuous pressure applications.*	Two independent check valves. Supplied with shut-off valves and ball type test cocks.	All cross connections subject to backpressure where there is a low potential health hazard or nuisance. Continuous pressure.	Main Supply Lines Food Cookers Tanks & Vats Lawn Sprinklers Fire Sprinkler Lines Commercial Pools NON-TOXIC
	DOUBLE DETECTOR CHECK VALVE BACKFLOW PREVENTERS *709DCDA low hazard* *909RPDA high hazard*	Double check valve backflow preventers with a water meter and double check or RPZ in by-pass line.	Fire protection system supply main. Detects leaks and unauthorized use of water.	Fire Sprinkler Lines
	DUAL CHECK VALVE BACKFLOW PREVENTER *For low hazard applications. Residential system containment. For continuous pressure.*	Two independent check valves. Checks are removable for testing.	Cross connections where there is a low potential health hazard and moderate flow requirements.	Residential Supply Lines (at the meter) NON-TOXIC
3	**SPECIALTY BACKFLOW PREVENTERS with INTERMEDIATE ATMOSPHERIC VENT** *For low hazard cross connections in small pipe sizes. Continuous pressure applications.*	Two independent check valves with intermediate vacuum breaker and relief valve.	Cross connections subject to backpressure or back-siphonage where there is low health hazard. Continuous pressure.	Boilers (Small) Cooling Towers (Small) Dairy Equipment Residential
			Pump outlet to prevent backflow of carbon dioxide gas and carbonated water into the water supply system to beverage machines.	Post-Mix Carbonated Beverage Machine
	LABORATORY FAUCET DOUBLE CHECK VALVE with INTERMEDIATE VACUUM BREAKER *In small pipe sizes for moderate to low hazard.*	Two independent check valves with intermediate vacuum breaker and relief vent.	Cross connections subject to backpressure or back-siphonage where there is a low health hazard.	Laboratory Faucets and Pipe Lines Barber Shop and Beauty Parlor Sinks
4	**ATMOSPHERIC VACUUM BREAKERS** *For high hazard cross connections not subject to continuous pressure - 6" above flood rim*	Single float and disc with large atmospheric port.	Cross connections not subject to backpressure or continuous pressure. Install at least 6" above fixture rim. Protection against back-siphonage only.	Process Tanks Dishwashers Soap Dispensers Washing Machines Lawn Sprinklers
	PRESSURE TYPE VACUUM BREAKERS *For high hazard cross connections. Continuous pressure applications - 12" above flood rim.*	Spring loaded single float and disc with independent 1st check. Supplied with shut-off valves and ball type test cocks.	This valve is designed for installation in a continuous pressure potable water supply system 12" above the overflow level of the system being supplied. Protection against back-siphonage only.	Laboratory Equipment Cooling Towers Comm. Laundry Machines Swimming Pools Chemical Plating Tanks Lg. Toilet & Urinal Facilities Degreasers, Photo Tanks Live Stock Water Systems Lawn Sprinklers
	HOSE CONNECTION VACUUM BREAKERS *For residential and industrial hose supply outlets not subject to continuous pressure.*	Single check with atmospheric vacuum breaker vent.	Install directly on hose bibbs, service sinks and wall hydrants. Not for continuous pressure.	Hose Bibbs Service Sinks Hydrants

For additional cross connection control information, send for F-50 brochure.

For Cross Connection Control in Potable Water Distribution Systems

APPLICABLE STANDARDS	WATTS PRODUCT No. AND SIZES	Page Index Series/No.	 PAGE No.
A.S.S.E. No. 1013 A.W.W.A. C506 FCCCHR of USC U.P.C. and S.B.C.C.I. CSA B 64.4 Sizes ¾"- 10" U.L. #EX3185 Sizes 2½"- 10"	**909 Series** ¾"- 10" **009 Series** ¾"- 2", 2½", 3" 	909 009	4, 5, 6, 10
		Test Kits	5
A.S.S.E. No. 1015 A.W.W.A. C506 FCCCHR of USC CSA B 64.5 Sizes ¾"- 10" U.L. #EX3185 Sizes 2½"- 10"	**709 Series** ¾"- 10" **007 Series** ¾"- 2" 	709 007	8, 9 10
Series 709DCDA A.S.S.E. No. 1015 A.W.W.A. C506 FCCCHR of USC U.L. #EX3185 Sizes 2½-10"	**709DCDA Series** **909RPDA Series**  Sizes: 3", 4", 6", 8", 10"	709DCDA 909RPDA	11
ANSI/A.S.S.E. No. 1024 CSA B64.6	**7 Series** ½"- 1¼"  WES2-7 Water meter easy-setter retrofit adapter with No. 7. WS2-7 Water meter setter with No. 7.	7	12, 13
		Gov. 80	12, 13
		Test Kit	5
A.S.S.E. No. 1012 CSA B 64.3	**9D Series** ½", ¾" 	9D 911, 911S B911, B911S	14, 15 15
Special Approvals	**9BD Series**  Size: ⅜" F.C.T. ¼", ⅜ NPTM	9BD	17
N9-CSA B64.8 (NLF9) A.S.S.E. No. 1035 Listed by IAPMO CSA B64.7	**No. NLF9**  Size: 3/8" **No. N9**  Sizes: 1/4", 3/8"	NLF9 N9	16 16
		7-⅜"	16
A.S.S.E. No. 1001 ANSI. A112.1.1 CSA B 64.1.1 FCCCHR of USC Listed by IAPMO	**288A Series**  Sizes: 1/4", 3/8", 1/2", 3/4", 1", 1 1/4", 1 1/2", 2", 2 1/2", 3"	288A	20, 21
		N388	20
A.S.S.E. No. 1020 CSA B64.1.2 FCCCHR of USC	**800 Series**  Sizes: 1/2", 3/4", 1", 1 1/4", 1 1/2", 2"	800 800M	18, 19
A.S.S.E. No. 1011 CSA B 64.2	**8 Series**  **No. 8A** (Non-removable) **No. NF-8** (Non-removable with drain)  Size ¾" HT	8, 8A, 8B S8, 8P and NF8	22, 23

"The answer to THERMAL EXPANSION problems", see page 13.

009QT Series Standard Reduced Pressure Zone Backflow Preventer

Sizes: ¾"- 3"

Watts 009QT Series Backflow Preventers are designed to provide protection of the safe drinking water supply in accordance with national plumbing codes and water utility authority requirements. They can be utilized in backflow prevention programs, including high hazard cross-connections in plumbing systems, or for containment at the service line entrance.

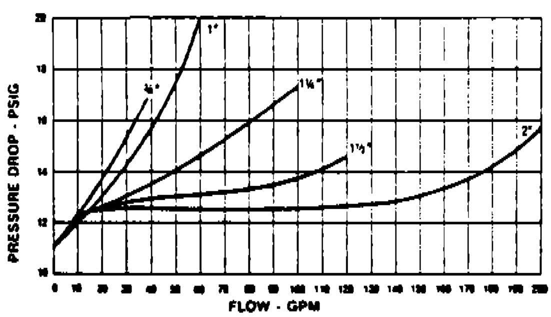
This series features two in-line, independent check valves with an intermediate relief valve. All sizes are constructed with NPT body connections. Standardly furnished with ball type test cocks and quarter-turn, full port, resilient seated bronze ball valve shut-offs (¾"-2") No. 009-QT. For NRS gate valve shut-offs, order No. 009. Sizes 2½" and 3" have resilient wedge NRS flanged gate valve shut-offs No. 009-NRS-RW.

- **Modular construction** • **Renewable seats**
- **No special tools required for servicing**

STANDARDS: Tested and certified under the following standards for reduced pressure zone backflow preventers; A.S.S.E. Std. No. 1013, AWWA Std. No. C506, FCCCHR of USC manual, Section 10, IAPMO listed.

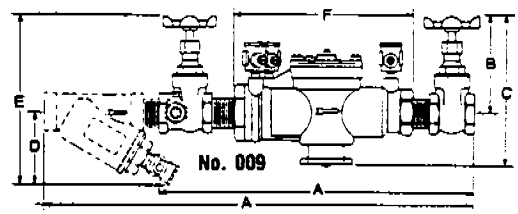
PRESSURE—TEMPERATURE

Supply pressure up to 175 PSI. Water temp. up to 180°F.



For additional information, send for ES-009 and ES-009L.

No. 009QT



No. 009

*SS models have same dimensions and weight.

Dimensions in Inches, Weights in lbs.

SIZE	TYPE	A	B	C	D	E	F	WGT.
¾"	009*	14	3⅝	6			8¼	11¼
	009-S*	18⅝	3⅝	6	2⅛	5¾	8¼	13¼
1"	009*	14¼	4½	6⅞			8¼	12
	009-S*	21⅞	4½	6⅞	3⅛	7⅝	8¼	15
1¼"	009 009-SS	19¼	5	8½			12½	27⅝ 28¼
	009-S 009-SS	24⅞	5	8½	3¼	8¾	12½	30¼ 31⅞
1½"	009 009-SS	19¾	5⅜	8⅞			12½	28⅝ 29
	009-S 009-SS-S	26⅝	5⅜	8⅞	3½	8⅞	12½	32⅞ 33½
2"	009 009-SS	21	6½	10			12½	30 30⅝
	009-S 009-SS-S	28¾	6½	10	4	10½	12½	38 38⅝

OPTIONS (can be combined):

Sizes: ¾"- 2"

Prefix U - union connections

Suffix

- **S** - with bronze strainer
- **SS** - with stainless steel replaceable check valve seats for aggressive water conditions
- **QT-T** - for "T" handle ball valve shut-offs (¾", 1")
- **LF** - without shut-off valves

Sizes: 2½" and 3"

Suffix

- **S** - with epoxy coated strainer
- **NRS-RW** - with resilient wedge non-rising stem shut-offs
- **QT** - with quarter turn, full port, resilient seated ball valve shut-offs
- **OSY** - with outside stem and yoke gate valves
- **LF** - without shut-off valves

007QT Series Double Check Valve Assembly

Sizes: ¾", 1", 1½" and 2"

Watts 007QT Series Double Check Valve Assembly is designed to provide protection of the safe drinking water supply in accordance with national plumbing codes and water utility authority requirements for containment at the service line entrance. They can be applied to a variety of installations where the degree of hazard is considered to be low.

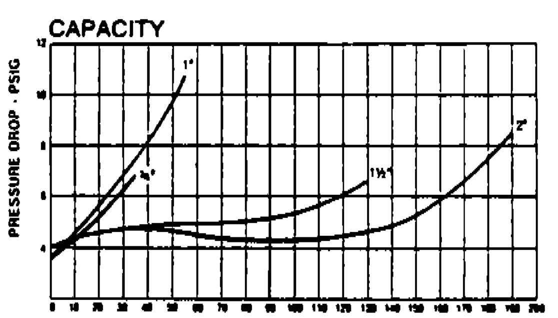
All sizes can be installed horizontally or vertically and are standardly equipped with ball type test cocks. Series 007QT has quarter-turn, full port, resilient seated, bronze ball valve shut-offs. For NRS gate valve shut-offs, order No. 007.

- **Modular construction** • **Renewable seats**
- **No special tools required for servicing**

STANDARDS: Tested and certified under the following standards for double check valve assemblies: A.S.S.E. Std. No. 1015, AWWA Std. No. C506, FCCCHR of USC manual, Section 10, IAPMO listed.

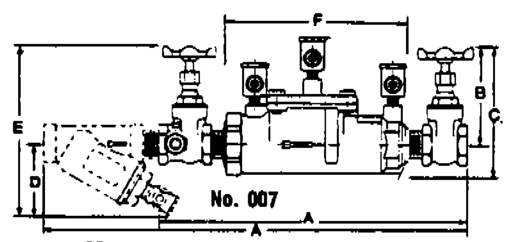
PRESSURE—TEMPERATURE

Supply pressure up to 175 PSI. Water temp. up to 180°F.



For additional information, send for ES-007.

No. 007QT



No. 007

*SS models have same dimensions and weight.

Dimensions in Inches, Weights in lbs.

SIZE	TYPE	A	B	C	D	E	F	WGT.
¾"	007*	14	4⅛	5½			8¼	9¼
	007-S*	18⅝	4⅛	5½	2⅛	6⅞	8¼	11¼
1"	007*	15¼	4½	5⅞			8¼	10
	007-S*	21⅞	4½	5⅞	3⅛	7⅝	8¼	13
1½"	007 007-SS	19¾	5⅜	7⅝	—	—	12½	24½ 25⅞
	007-S 007-SS	26⅝	5⅜	7⅝	3½	8⅞	12½	29 29⅝
2"	007 007-SS	21	6½	8¾	—	—	12½	26⅞ 26¾
	007-S 007-SS-S	28¾	6½	8¾	4	10½	12½	34⅞ 34¾

OPTIONS (can be combined):

Prefix U - Union connections

Suffix

- **S** - with bronze strainer
- **SS** - with stainless steel replaceable check valve seats for aggressive water conditions
- **QT** - with quarter turn, full port, resilient seated bronze ball valve shut-offs
- **QT-T** - for "T" handle ball valve shut-offs (¾", 1")
- **LF** - without shut-off valves

For technical assistance, call your authorized Watts agent.

Region	Agent	Address	Telephone #	Fax #
NORTHEASTERN REGION	Trayco Sales, Inc.	P.O. Box 653, Lynnfield, MA 01940	617 334-6078	617 334-2859
	W. P. Haney Co., Inc.	51 Norfolk Ave., South Easton, MA 02375	508 238-2030	508 238-8353
	E. W. Leonard, Inc.	Ray Palmer Rd., P.O. Box 371, Moodus, CT 06469-0371	203 873-8691	203 873-8693
	WMS Sales, Inc.	9580 County Rd., Clarence Center, NY 14032	716 741-9575	716 632-0633
	WMS Sales, Inc.	7437 Meadowbrook Dr., Baldwinsville, NY 13027	315 622-0763	315 622-0764
	WMS Sales, Inc.	4 McMillen Place, Delmar, NY 12054	518 475-1017	
	Edwards, Platt & Deely, Inc.	1 Stone Place, Bronxville, NY 10708 (Warehouse: 263 Royal Ave., Hawthorne, NJ)	Office: 212 671-6400 800 433-3158 Warehouse: N.Y. 914 337-5511	914 337-5069
	Vernon Bitzer Associates, Inc.	138 Railroad Dr., Northhampton Ind. Pk., Ivyland, PA 18974	215 953-1400	215 953-1250
	J. B. O'Connor Company, Inc.	120 Union St., Bridgeville, PA 15017	412 221-5300	412 221-4510
	Bruce Parrott, N.E. Reg. Mgr.	815 Chestnut St., North Andover, MA 01845	508 688-1811	508 794-1848
SOUTHEASTERN REGION	RMI	Glenfield Bus. Ctr., 2535 Mechanicsville Tpk., Richmond, VA 23223	804 643-7355	804 359-8490
	Smith & Stevenson	4935 Chastain Ave., Charlotte, NC 28210	704 525-3388	704 525-6749
	Central Sales Company	2700 Murfreesboro Rd., Antioch, TN 37013	615 361-4244	615 366-1175
	Central Sales Company	2170 York Ave., Memphis, TN 38104	901 278-2251	901 272-1614
	Spotswood Associates	6700 Best Friend Rd., Norcross, (Atlanta) GA 30071-2919	404 447-1227	404 263-6899
	Distributor Sales of Florida	6520 35th St. North, Pinellas Park, FL 33565	813 527-6651	813 528-0602
	Earl L. Griffin Co.	2776 B.M. Montgomery St., Birmingham, AL 35209	205 879-3469	205 870-5027
	Billingsley & Associates, Inc.	2000 Clearview Pkwy. Suite 201, Metairie, LA 70001	504 885-6771	504 885-7516
	Billingsley & Associates, Inc.	478 Cheyenne Lane, Madison, MS 39110	601 856-7565	
	JLM & Assoc., Inc.	P.O. Box 10301, Caparra Heights Station, Rio Piedras, PR 09922-0301	809 782-4244	809 782-6576
	The Joyce Agency, Inc.	10520 Warwick Ave., Fairfax, VA 22030 (Warehouse: 7313 Boudinot Dr., Springfield, VA)	703 591-2808	703 591-0826
	Bill Johnson, S.E. Reg. Director	P.O. Box 140153, Orlando, FL 32814-0153	407 898-6873	
MIDWEST REGION	Mid-Continent Marketing Services Ltd.	1724 Armitage Ct., Addison, IL 60101	708 953-1211	708 953-1067
	Mid-Continent Marketing Services Ltd.	11424 Whistler Dr., Indianapolis, IN 46229	317 894-3618	317 894-3974
	Advance Industrial Marketing Ltd.	923 South Bird St., Sun Prairie, WI 53590	608 837-5005	608 837-2368
	Dave Watson Associates	1325 West Beecher, Adrian, MI 49221	517 263-8988	517 263-2328
	The Harris-Billings Co.	P.O. Box 41304, 1920 Annapolis Lane North, Plymouth, MN 55441	612 559-9400	612 559-8239
	Mack McClain & Associates, Inc.	1537 Ohio St., Des Moines, IA 50314	515 288-0184	515 288-5049
	Mack McClain & Associates, Inc.	15090 West 116th St., Olathe, KS 66062	913 339-6677	913 339-9518
	Mack McClain & Associates, Inc.	16037 "N" Circle, Omaha, NE 68135	402 896-8804	402 896-8807
	R. R. Iverson & Associates	4141-A South 68th East Ave., Tulsa, OK 74145	918 664-0423	918 664-0425
	J. W. Sullivan Company	7901 Manchester Ave., St. Louis, MO 63143	314 644-5454	314 644-5527
	Disney-McLane, Inc.	2704 Colerain Ave., Cincinnati, OH 45225	513 541-1682	513 541-0073
	Madsen-Bayer & Associates, Inc.	2510 Englewood Dr., Columbus, OH 43219	614 476-1833	614 476-1846
	Madsen-Bayer & Associates, Inc.	4640 Warner Rd., Garfield Heights, OH 44125	216 641-5808	216 641-5546
	Gary S. Gilpin Sales Co.	4468 Emberson Ave., Louisville, KY 40209	502 367-2178	502 367-9080
	Don Sinsabaugh, MidWest Reg. Sales Mgr.	42 W. 597 Steeple Chase, St. Charles, IL 60175	708 377-3671	708 513-5063
WESTERN REGION	R. C. Hartnett & Associates	30852 Huntwood Ave., Hayward, CA 94544	415 471-7200	415 471-4441
	Hollabaugh Brothers & Associates	1260 6th Ave. South, Seattle, WA 98134-1308	206 467-0346	206 467-8368
	Hollabaugh Brothers & Associates	3028 S.E. 17th Ave., Portland, OR 97202	503 238-0313	503 235-2824
	R. E. Fitzpatrick Sales, Inc.	16 East 8th Ave., Midvale, UT 84047	801 566-7156	801 556-4979
	Hudson and Lening Sales Co.	2596 W. Barberry Place, Denver, CO 80204	303 623-1186	303 623-8676
	Benisek Associates	2267 Yates Ave., Los Angeles, CA 90040	213 685-9900	213 685-3164
	R. D. Wager Company.	2012 West 4th St., Tempe, AZ 85281	602 968-8586	602 829-7682
	Rocky Mountain Marketing	3300 Princeton N.E., N-27, Albuquerque, NM 87107	505 883-4405	505 881-3767
	Hugh M. Cunningham, Inc.	4309 N. Beltwood Pkwy. Dallas, TX 75244-3294	214 661-0222	214 490-6678
	Hugh M. Cunningham, Inc.	1999 Kolfahl, Houston, TX 77023	713 923-2371	713 923-8357
	Hugh M. Cunningham, Inc.	5130 Service Center, San Antonio, TX 78218	512 661-4161	512 661-0954
	Crown Sales	360 Mokauea St., Honolulu, HI 96819	808 845-7881	808 841-4504
	Jim Engard, West Reg. Sales Mgr.	749 Renate Way, Paso Robles, CA 93446	805 239-8852	805 239-8859
INTERNATIONAL	**HDQTRS:** Watts Regulator Co./EXPORT	815 Chestnut St., No Andover, MA 01845 **Telex:** 94-7460	508 688-1811	508 794-1848 508 794-1674
	Watts Regulator of Canada Ltd.	441 Hanlan Rd., Woodbridge, Ontario L4L3T1, Canada	416 851-8591	416 851-8788
	Walmar	24 Gurdwara Rd., Nepean Ontario K2E 8A2	613 225-9774	613 225-2972
	Currie Agencies Ltd.	8117 Underhill Ave., Burnaby, B.C. V5A 3C8	604 420-6070	604 420-9022
	Polymex Controles Inc.	1375 Boul Charest Ouest, Suite 6, Quebec City, Quebec G1N 2E7	418 682-1690	418 682-8743
	Watts Regulator of Canada Ltd.	2690 Sabourin, Ville St. Laurent, Quebec H4S 1M2	514 337-9010	514 337-8843
	Murray Krovats Sales Agency	941 Cerin St., Winnipeg, Manitoba R36 2W6	709 786-2747	709 775-3186
	Bayers-Conte Sales Ltd.	1801-10th Ave. Southwest, Calgary, Alberta T3C 0K2	403 244-1818	403 245-9297
	W.B. Gingerich Sales Ltd.	107 Hamilton Rd., New Hamburg, Ontario N0B 2G0	519 662-2460	519 662-2491
	S.T.E. Fetterly & Son Ltd.	6080 Young St., Ste. 911, Halifax, NS B3K 5L8	902 454-9377	902 454-6085
	Watts Regulator of Nederland b.v.	P.O. Box 98, 6960 AB Eerbeek, Holland Telex 844-35365	(011) 31-8-338-59028	8-338-52073

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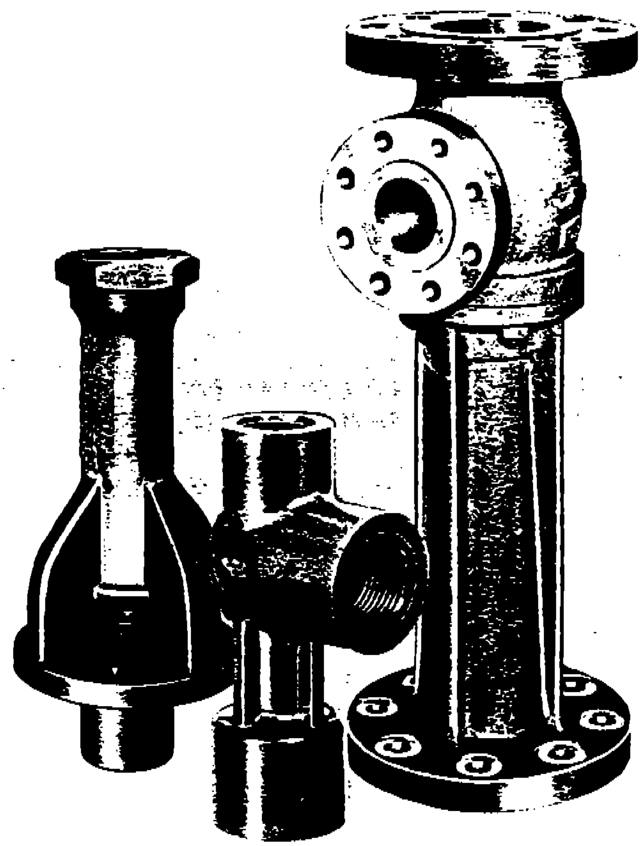
BULLETIN 2M

WATER JET EDUCTORS



KETEMA
SCHUTTE AND KOERTING
DIVISION

WATER JET EDUCTORS

INTRODUCTION

The Water Jet Eductor is a type of ejector which utilizes the kinetic energy of a pressurized liquid to entrain another liquid, mix the two, and discharge the mixture against a counter pressure. Ejectors of this type are used throughout industry for pumping and mixing operations.

APPLICATIONS

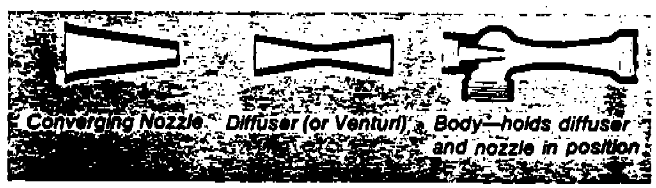
Water jet eductors have numerous uses in the plant such as lifting, pumping, mixing and agitation of liquids, granular solids and slurries. Some specific applications are: draining flooded areas, emptying tanks and sumps, pumping and mixing operations in oil treating systems, dewatering sand and coal barges, introducing anti-knock agents and coloring additives into gasoline, continuous blending, acidifying, causticizing of oils, producing emulsions, pumping food products, pumping sand and filter clay, tank mixing, and various proportioning operations. As an example of eductor performance in a typical use, a jet eductor measuring 8½" in length will empty a 500 gal. water tank in less than half an hour, using water at 60 psig, as the sole source of motive power.

FEATURES

- **SELF-PRIMING** Eductors require no priming and can be used for either continuous or intermittent operation.
- **SIMPLE AND RELIABLE** Since the basic eductor has no moving parts to wear or break, only periodic inspection is required.
- **CORROSION AND EROSION RESISTANT** Because they can be made from most materials, or coated with corrosion resistant materials, eductors can be made resistant to the corrosive effects of the liquids handled and the environment.
- **AUTOMATIC CONTROL** Units can be adapted for automatic operation by means of a regulating spindle or a snap valve and float arrangement.
- **NON-ELECTRICAL** Eductors can be used in hazardous locations where electrically operated alternatives would require expensive explosion-proofing.
- **EASY TO INSTALL** Either threaded or flanged connections are available. Units are compact, relatively light and can be adapted to a variety of piping configurations.
- **LOW COST** Water Eductors are inexpensive in relation to the work they do.

CONSTRUCTION

Water Jet Eductors consist of only three basic components: a converging nozzle, a diffuser (or venturi) and a body to hold these parts in their proper relative positions and provide a suction chamber.



Jet ejectors can be made from most workable materials, such as: cast iron, bronze, stainless steel, aluminum, polyvinyl chloride, polyester fiberglass, Haveg , Teflon[2] and Hastelloy[3].

A variety of types and sizes are available as noted on the following pages. Certain variables such as pressure, temperature, viscosity, density, operating conditions of suction and discharge fluids, and desired results must be considered in determining the type of eductor best suited to your needs. S&K engineers will work with you to select the proper eductor for your application.

Request Performance Data Supplement 2M for operating characteristics of water jet eductors.

CONTENTS

[2]TM E.I. DuPont de Nemours [3]TM Stellite Div., Cabot Corp.

TYPE 264 and 266 WATER JET EDUCTORS

SK Type 264 and Type 266 Water Jet Eductors are designed for liquid pumping and mixing operations and for the handling of some solids where requirements do not necessitate capacities greater than those obtained with sizes up to and including 6″. They are considered the standard eductors within this size range. Typical applications begin on Page 10.

In operation, pressure liquid enters the eductor through the pressure nozzle and produces a high velocity jet. This jet action creates a vacuum in the line which causes the suction liquid to flow up into the body of the eductor where it is entrained by the pressure liquid. Both liquids are thoroughly mixed in the throat of the eductor and are discharged against back pressure. The streamlined body with no pockets permits the pressure liquid to move straight through the eductor and reduces the possibility of solids in the suction material collecting and clogging. In addition, pressure drop in the suction chamber is held to a minimum.

Accompanying Performance Data provides performance information.

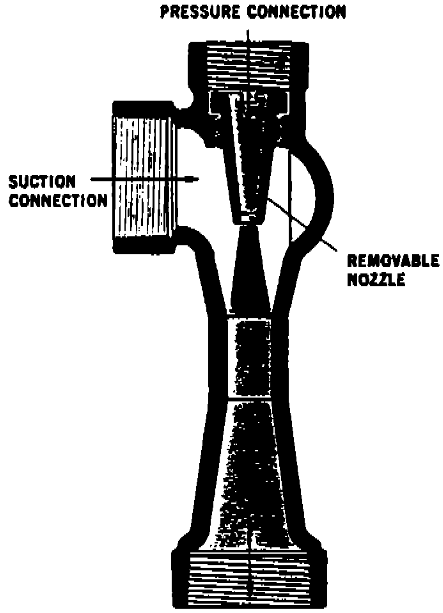


Fig. 1. TYPE 264 EDUCTOR. Eductors of this type have streamlined bodies with threaded pipe connections. They are made in sizes ranging from ½″ to 3″ and are stocked in these sizes in ductile iron and bronze and Type 316 stainless steel. They are stocked in sizes from ½″ through 1″ in Kynar*, and in 1½″, 2″, and 3″ in PVC. Other materials are available on order.

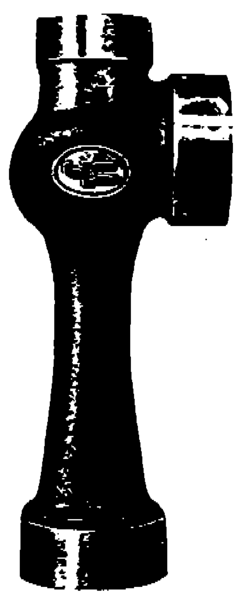


Fig. 2. TYPE 264 EDUCTOR

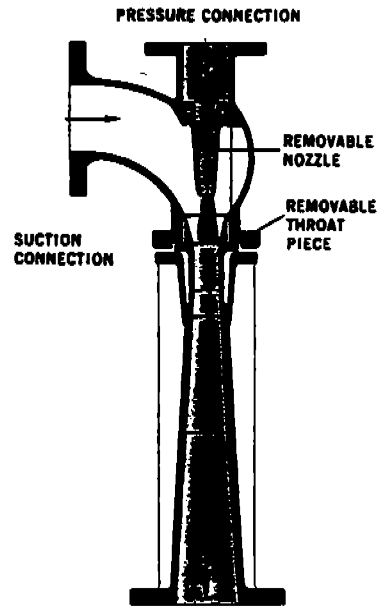
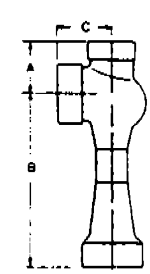
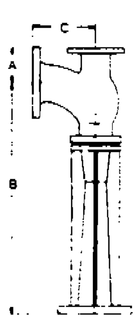


Fig. 3. TYPE 266 EDUCTOR. These eductors are similar to Type 264 Eductors except that they have flanged connections and removable throat bushings along with removable nozzles. They are supplied in cast iron, bronze-mounted in 4″ and 6″ sizes. Other materials can be supplied on special order.

TABLE 1. SIZES and DIMENSIONS, SK WATER JET EDUCTORS, TYPES 264 and 266

Size in Inches	Connections in Inches		Wgt. in Lbs.	Working Pressures						Dimensions in Inches			Max. Round Particle Size in Inches
				Cast Iron		Bronze		Stainless Steel		A	B	C	
	Suction Disch.	Pressure		Motive psi	Body psi	Motive psi	Body psi	Motive psi	Body psi				
SK Type 264 Eductor													
½	½	⅜	¼	150	125	125	100	600	500	1¹⁄₁₆	2⁹⁄₁₆	1⅛	¹⁄₁₆
¾	¾	½	1¼	125	125	100	100	500	500	1⅜	3⅜	1¼	⅛
1	1	¾	2	150	150	150	125	600	600	1½	4³⁄₁₆	1⅜	⁵⁄₃₂
1½	1½	1	4	150	100	125	90	600	400	2	6½	2	⁵⁄₁₆
2	2	1¼	6	150	100	125	85	600	400	2¼	7⅜	2¼	⅜
2½	2½	1½	11	200	150	200	125	600	300	2¹¹⁄₁₆	9¼	3⅛	⅜
3	3	2	20	250	150	225	125	600	400	3⅛	11¼	3½	¹³⁄₁₆
SK Type 266 Eductor													
4	4	2½	100	125	125	—	—	—	—	4⅜	19¼	7¹³⁄₁₆	1
6	6	4	180	125	125	—	—	—	—	6¹⁄₁₆	28⅜	9⅛	1⅛





*TM Pennwalt Corp.

TYPE 264 PVC and KYNAR WATER JET EDUCTORS

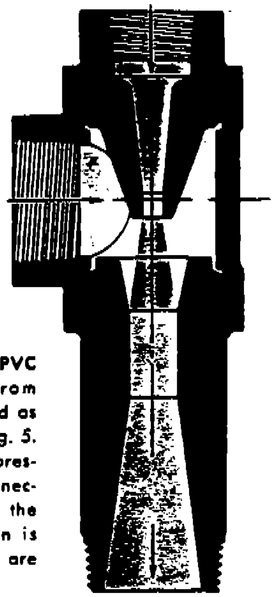


Fig. 4. TYPE 264 PVC EDUCTOR. Sizes from 1½" up are designed as shown here and in Fig. 5. On these sizes, the pressure and suction connections are female and the discharge connection is male. All connections are threaded.

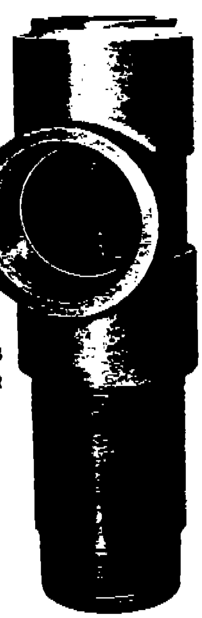


Fig. 5. TYPE 264 PVC EDUCTOR

Type 264 PVC and Kynar Eductors offer resistance to many corrosive media. PVC Eductors are not recommended, however, for acetone, ketones, ether, esters, aromatic hydrocarbons or chlorinated hydrocarbons. A table of recommended uses is available on request. Maximum temperature rating is 150°F. Kynar Eductors will handle PVC applications including those mentioned above. Kynar's temperature limitation is 250°F. Pressure ratings are given in Table 2.

Type 264 PVC and Kynar Eductors operate on the same principle as do all other SK Eductors. Performance characteristics with water are shown in accompanying Technical Data. For performance with other liquids, contact SK.

Nozzles and diffusers are not removable on these eductors. Sizes 1" and smaller are of molded construction.

Fig. 6. TYPE 264 KYNAR EDUCTOR, ½" to 1" Design. Sizes ½", ¾", and 1" look like this. All connections are female and are threaded.

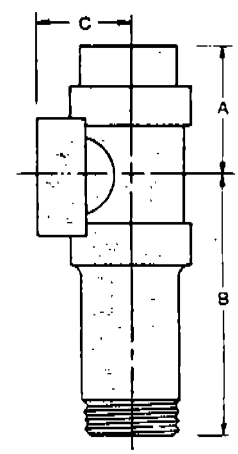
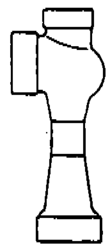
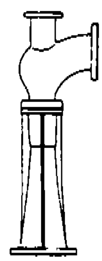


TABLE 2. SIZES, DIMENSIONS, and PARTICLE SIZE DATA, TYPE 264 WATER JET EDUCTORS

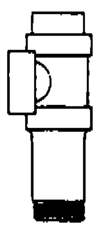
Size in Inches	Connections in Inches		Weight in Lbs.	Dimensions in Inches			Working Pressure (psig) at 75°F	Maximum Round Particle Sizes (in Inches) Eductors Will Handle
	Suc.-Disch.	Press.		A	B	C		
½S	½S	⅜S	½	1 7/16	3¼	1 7/16	325	1/16
½	½	⅜	½	1 7/16	3¼	1 7/16	325	1/16
¾	¾	½	½	1 11/16	3½	1 11/16	275	⅛
1	1	¾	½	1⅞	3 11/16	1⅞	250	5/32
1½	1½	1	1½	2 9/16	5 11/32	2 1/16	200	5/16
2	2	1¼	2½	3 1/32	6 21/32	2 5/32	185	⅜
3	3	2	6¾	4⅛	9½	3⅞	165	13/16



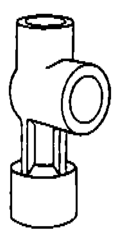
Typical Type 264 Eductor Threaded Connections (½" thru 3" sizes)



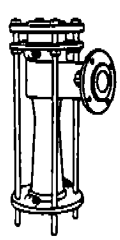
Typical Type 266 Eductor Flanged Connections (4" or 6" size)



Typical Type 264 Eductor Made of PVC



Typical Type 264 Eductor (Molded KYNAR or Polypropylene)



Typical Type 212 Eductor (Haveg)

TABLE 1. Suction Capacities of Water Jet Eductors, Types 264, 266, and 212—1 Inch Size Only. To determine capacities for sizes other than 1 inch, multiply these capacities by the proper capacity ratio factor noted in Tables 2 or 3 (for PVC, KYNAR or Polypropylene Eductors).

Suction Lift in Ft. of Water	Disch. Press psi Gauge	Water Consumption gpm	Suction Cap. of Standard 1" Water Jet Eductor—gpm—Water Temp. 80° F. Operating Water Pressure psi Gauge: 10	20	30	40	50	60	80	100
0	0	Suction Operating	5.85 3.55	8.1 5.0	9.5 6.1	10.0 7.1	12.0 7.9	12.0 8.7	12.0 10.0	12.0 11.0
	5	Suction Operating		1.4 4.9	4.1 6.1	6.0 7.0	8.0 7.9	10.0 8.6	11.0 10.0	12.0 11.0
	10	Suction Operating			0.28 5.9	2.3 6.8	4.8 7.8	6.4 8.5	8.8 9.8	11.0 11.0
	15	Suction Operating					1.2 7.7	3.4 8.4	5.9 9.8	8.6 11.0
	20	Suction Operating						0.3 8.2	3.5 9.7	5.9 11.0
	25	Suction Operating							0.83 9.6	3.9 11.0
	30	Suction Operating								1.7 11.0
5	0	Suction Operating	4.4 3.9	6.8 5.3	8.6 6.4	9.6 7.3	11.0 8.1	11.0 8.8	12.0 10.0	12.0 11.0
	5	Suction Operating		1.5 5.2	3.2 6.3	5.0 7.2	7.0 8.0	9.0 8.7	11.0 10.0	11.0 11.0
	10	Suction Operating				1.9 7.1	3.6 7.9	5.6 8.6	8.6 10.0	10.0 11.0
	15	Suction Operating					1.1 7.8	2.6 8.6	5.8 9.9	8.3 11.0
	20	Suction Operating							3.3 9.8	5.6 11.0
	25	Suction Operating							0.47 9.8	3.6 11.0
	30	Suction Operating								1.5 11.0
10	0	Suction Operating	2.0 4.2	4.6 5.5	6.7 6.6	8.3 7.4	9.0 8.2	10.0 9.0	10.0 10.0	10.0 11.0
	5	Suction Operating			2.0 6.5	4.3 7.4	5.9 8.2	7.7 8.9	9.9 10.0	10.0 11.0
	10	Suction Operating				1.1 7.3	3.0 8.1	4.5 8.8	8.1 10.0	9.6 11.0
	15	Suction Operating					1.1 8.0	2.1 8.7	5.6 10.0	7.3 11.0
	20	Suction Operating							2.8 9.9	5.3 11.0
	25	Suction Operating								2.8 11.0
	30	Suction Operating								1.1 11.0
15	0	Suction Operating		3.3 5.7	5.3 6.8	7.9 7.6	8.4 8.4	8.9 9.1	8.9 10.0	9.1 12.0
	5	Suction Operating				4.0 7.6	4.9 8.3	7.3 9.0	8.6 10.0	9.1 11.0
	10	Suction Operating					2.4 8.2	4.0 9.0	6.4 10.0	8.6 11.0
	15	Suction Operating							4.2 10.0	6.8 11.0
	20	Suction Operating							2.1 10.0	4.5 11.0
	25	Suction Operating								1.9 11.0
20	0	Suction Operating		2.0 6.0	4.0 7.0	6.4 7.8	7.8 8.6	7.8 9.3	7.8 11.0	7.8 12.0
	5	Suction Operating				2.8 7.7	3.9 8.5	6.3 9.2	7.8 10.0	7.8 12.0
	10	Suction Operating					1.2 8.3	3.1 9.1	5.7 10.0	7.1 12.0
	15	Suction Operating							3.6 10.0	5.4 11.0
	20	Suction Operating							1.4 10.0	3.8 11.0
	25	Suction Operating								1.5 11.0

Performance is for standard stock units. If not satisfactory for your conditions, refer to Nomograph on page 8 for units to meet conditions.

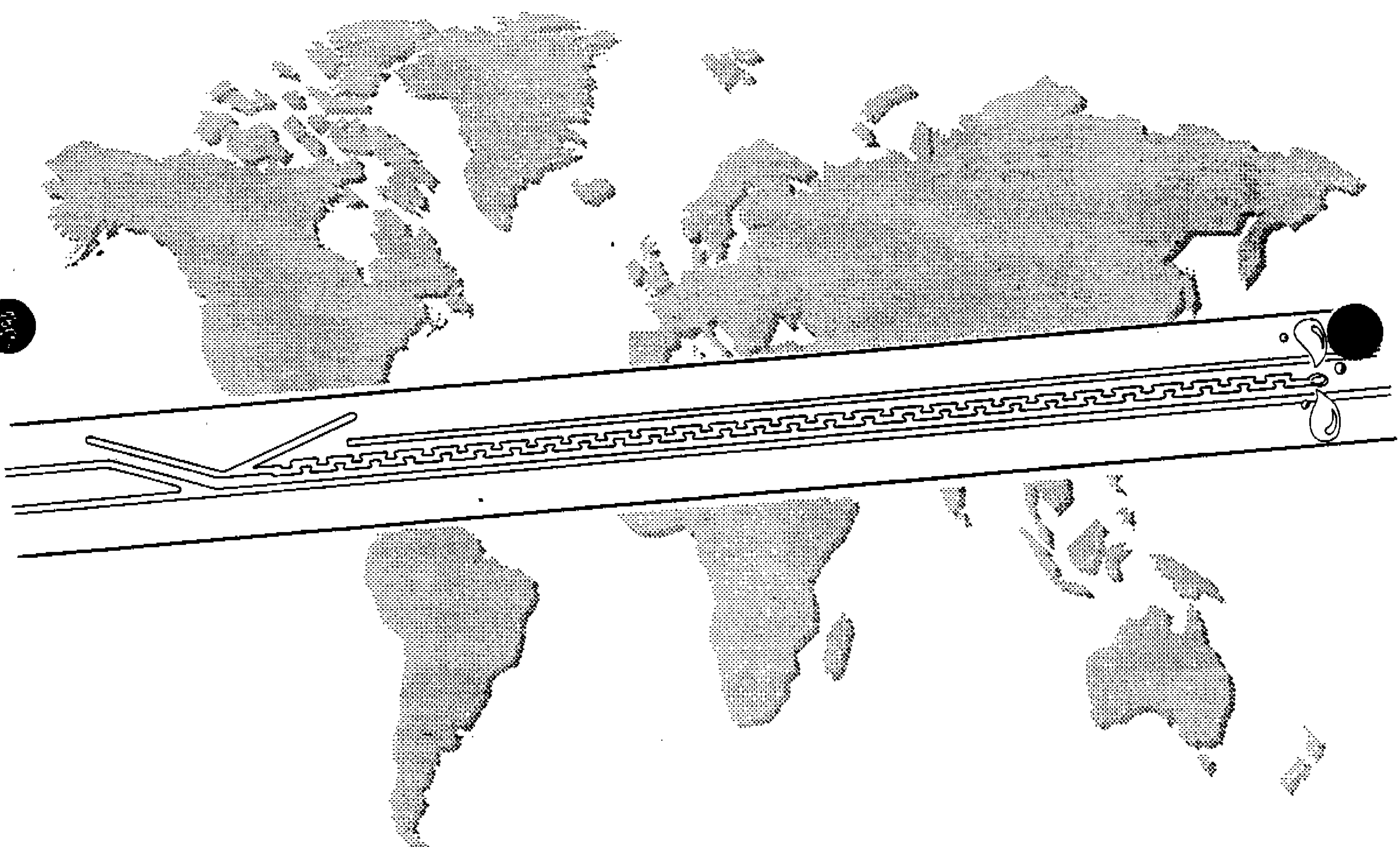
TABLE 2. Relative Capacities of Water Jet Eductors, Types 264, 266, and 212.

Size Eductor in Inches	½	¾	1	1½	2	2½	3	4	6
Capacity Ratio	0.36	0.64	1.00	2.89	4.00	6.25	9.00	16.00	36.00

TABLE 3. Relative Capacities of Water Jet Eductors Made from KYNAR, Polypropylene or PVC, Type 264.

Size Eductor in Inches	¼	½	¾	1	1½	2	3
Capacity Ratio	0.15	0.36	0.64	1.00	2.89	4.00	9.00

RO-DRIP®



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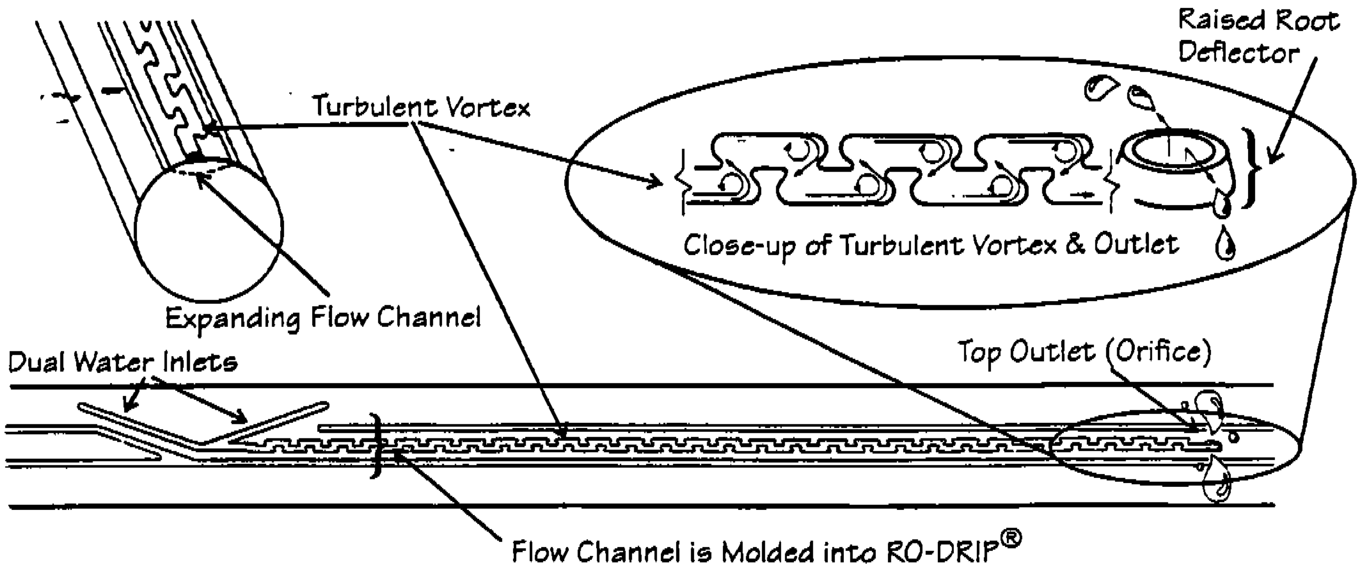


RO-DRIP® Features/Advantages

RO-DRIP® is a patented product with features unmatched by the competition.

◊	*Feature*:	Fully turbulent with vortex flow action
	Advantage:	Allows longer uniform runs; increased turbulence of RO-DRIP® keeps particles in suspension, resists plugging.
◊	*Feature*:	Expanding flow channel
	Advantage:	Flow channel automatically expands to allow purging of many contaminants when blockage occurs in the turbulent channel.
◊	*Feature*:	Raised root deflector around the top outlet (orifice)
	Advantage:	Deflects root and resists root intrusion.
◊	*Feature*:	Dual water inlets
	Advantage:	Two water inlets are same size as turbulent channel to reduce potential inlet plugging.
◊	*Feature*:	Flow channel is molded into the RO-DRIP® strip tubing
	Advantage:	The accurately formed flow channel produces a consistently reliable and uniform product.
◊	*Feature*:	Heat sealed construction of RO-DRIP®
	Advantage:	Gives more reliable and uniform product.
◊	*Feature*:	Tough top quality plastic
	Advantage:	Resists tearing and is less susceptible to damage. Ensures a strong product!

COMPARE THE FEATURES OF SIMILAR DRIP IRRIGATION PRODUCTS AND YOU WILL DETERMINE THE RIGHT CHOICE IS RO-DRIP®.

United States Units of Measurement

Part Number	Mil Thickness	Spacing	Flow Rate per 100 ft @ 8 PSI		Roll		Pallet	
			GPH	GPM	Length	Weight	Length	Weight
005-910820	5 mil	8"	20 GPH	.33 GPM	12,500'	75 lbs	200,000'	1,200 lbs
005-910840	5 mil	8"	40 GPH	.67 GPM	12,500'	75 lbs	200,000'	1,200 lbs
005-911215	5 mil	12"	15 GPH	.25 GPM	12,500'	75 lbs	200,000'	1,200 lbs
005-911224	5 mil	12"	24 GPH	.40 GPM	12,500'	75 lbs	200,000'	1,200 lbs
008-910820	8 mil	8"	20 GPH	.33 GPM	7,500'	70 lbs	120,000'	1,120 lbs
008-910840	8 mil	8"	40 GPH	.67 GPM	7,500'	70 lbs	120,000'	1,120 lbs
008-911215	8 mil	12"	15 GPH	.25 GPM	7,500'	70 lbs	120,000'	1,120 lbs
008-911224	8 mil	12"	24 GPH	.40 GPM	7,500'	70 lbs	120,000'	1,120 lbs
008-911620	8 mil	16"	20 GPH	.33 GPM	7,500'	70 lbs	120,000'	1,120 lbs
010-910840	10 mil	8"	40 GPH	.67 GPM	6,000'	70 lbs	96,000'	1,120 lbs
010-911224	10 mil	12"	24 GPH	.40 GPM	6,000'	70 lbs	96,000'	1,120 lbs
010-911620	10 mil	16"	20 GPH	.33 GPM	6,000'	70 lbs	96,000'	1,120 lbs
015-911224	15 mil	12"	24 GPH	.40 GPM	4,000'	70 lbs	64,000'	1,120 lbs
015-911620	15 mil	16"	20 GPH	.33 GPM	4,000'	70 lbs	64,000'	1,120 lbs
015-912417	15 mil	24"	17 GPH	.28 GPM	4,000'	70 lbs	64,000'	1,120 lbs

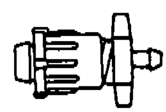
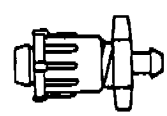
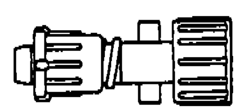
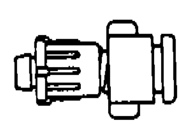
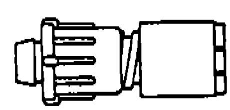
Metric Units of Measurement

Part Number	Mil Thickness	Spacing	Flow Rate per 100m @ .55 bars		Roll		Pallet	
			LPH	LPM	Length	Weight	Length	Weight
005-910820	.127 mm	20 cm	248 LPH	4.13 LPM	3,810 m	34 kg	60,960 m	544 kg
005-910840	.127 mm	20 cm	497 LPH	8.28 LPM	3,810 m	34 kg	60,960 m	544 kg
005-911215	.127 mm	30 cm	186 LPH	3.10 LPM	3,810 m	34 kg	60,960 m	544 kg
005-911224	.127 mm	30 cm	298 LPH	4.97 LPM	3,810 m	34 kg	60,960 m	544 kg
008-910820	.200 mm	20 cm	248 LPH	4.13 LPM	2,286 m	32 kg	36,576 m	508 kg
008-910840	.200 mm	20 cm	497 LPH	8.28 LPM	2,286 m	32 kg	36,576 m	508 kg
008-911215	.200 mm	30 cm	186 LPH	3.10 LPM	2,286 m	32 kg	36,576 m	508 kg
008-911224	.200 mm	30 cm	298 LPH	4.97 LPM	2,286 m	32 kg	36,576 m	508 kg
008-911620	.200 mm	41 cm	248 LPH	4.13 LPM	2,286 m	32 kg	36,576 m	508 kg
010-910840	.254 mm	20 cm	497 LPH	8.28 LPM	1,829 m	32 kg	29,261 m	508 kg
010-911224	.254 mm	30 cm	298 LPH	4.97 LPM	1,829 m	32 kg	29,261 m	508 kg
010-911620	.254 mm	41 cm	248 LPH	4.13 LPM	1,829 m	32 kg	29,261 m	508 kg
015-911224	1.127 mm	30 cm	298 LPH	4.97 LPM	1,219 m	32 kg	19,507 m	508 kg
015-911620	1.127 mm	41 cm	248 LPH	4.13 LPM	1,219 m	32 kg	19,507 m	508 kg
015-912417	1.127 mm	61 cm	211 LPH	3.51 LPM	1,219 m	32 kg	19,507 m	508 kg

RO-DRIP® products may be available as standard inventory or may require advance order and a minimum quantity. Configurations n[illegible] listed may be available on inquiry and/or special order. All orders are subject to availability of product at time of shipment. Manufacturer reserves the right to change specifications without notice.

ROBERTS
IRRIGATION PRODUCTS, INC.
700 RANCHEROS DRIVE
SAN MARCOS, CA 92069-3007
USA
(619) 744-4511
FAX:(619) 744-0914

RO-DRIP® Fittings

PART #	PRODUCT DESCRIPTION	PACKAGE	
060-009000	LOC SLEEVE COUPLING Used to connect two pieces of RO-DRIP® and/or repair/splice a cut line.	50	
060-009001	LOC SLEEVE x ½" SLIP Used to connect P.V.C. pipe manifolds with ½" slip connections to RO-DRIP® laterals.	50	
060-009002	LOC SLEEVE x ½" MALE ADAPTER Used to connect P.V.C. pipe manifolds with ½" pipe thread connections to RO-DRIP® laterals.	50	
060-009003	LOC SLEEVE x 250 BARB Used to connect RO-DRIP® to .250" I.D. supply tubing.	50	
060-009004	LOC SLEEVE x 400 BARB Used to connect RO-DRIP® to .375" I.D. supply tubing.	50	
060-009005	LOC SLEEVE x END CAP Used at the end of RO-DRIP® laterals to stop the flow of water. The end cap unscrews manually for flushing the laterals.	50	
060-009006	LOC SLEEVE x LAY FLAT ADAPTER Used to connect RO-DRIP® to vinyl lay flat manifold (header).	50	
060-009007	LOC SLEEVE x 350 COMPRESSION Used to connect .250" I.D. supply tubing by means of a compression adapter to RO-DRIP® laterals.	50	

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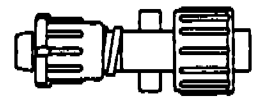
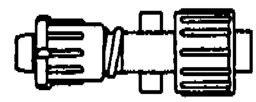
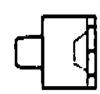
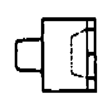
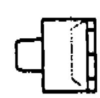
FAX:(619) 744-0914

RO-DRIP® Fittings

PART #	PRODUCT DESCRIPTION	PACKAGE	
060-009008	LOC SLEEVE x 400 COMPRESSION Used to connect .375" I.D. supply tubing by means of a compression adapter to RO-DRIP® laterals.	50	
060-009009	LOC SLEEVE x DRAIN VALVE LOW (.6 G.P.M @ 1 P.S.I.) Used at the end of RO-DRIP® laterals to stop the flow of water. Automatic flushing device closes when flow is .6 G.P.M. @ 1 P.S.I.	50	
060-009010	LOC SLEEVE x DRAIN VALVE HIGH (1.2 G.P.M. @ 2.5 P.S.I.) Used at the end of RO-DRIP® laterals to stop the flow of water. Automatic flushing device closes when the flow is 1.2 G.P.M. @ 2.5 P.S.I.	50	
060-009020	LOC SLEEVE x FEMALE HOSE CONNECTOR Used to connect RO-DRIP® lateral(s) to $^{3}/_{4}$" hose thread garden valve.	50	
062-001000	PVC PIPE ADAPTER x 350 COMPRESSION Used for connection of .250" I.D. supply tubing to RO-DRIP® laterals. Compression adapter is glued onto P.V.C. manifolds after drilling $^{29}/_{64}$" hole.	50	
062-001001	PVC PIPE ADAPTER x 400 COMPRESSION Used for connection of .375" I.D. supply tubing to RO-DRIP® laterals. Compression adapter is glued onto P.V.C. manifolds after drilling $^{29}/_{64}$" hole.	50	
062-001002	PVC PIPE ADAPTER x 600 COMPRESSION Used for connection of .510" I.D. supply tubing to RO-DRIP® laterals. Compression adapter is glued onto P.V.C. manifolds after drilling $^{29}/_{64}$" hole.	50	

RO-DRIP® Installation and Start-up

Important for all Installations

All systems must be carefully designed and engineered before installation begins.

Do not use galvanized steel, steel, or aluminum in the system. Install proper filtration for efficient and proper operation of the system.

Where ground pests are a potential problem pest controls must be implemented before installing RO-DRIP®.

Use proper regulation devices.

If there are significant slopes, check valves and air relief valves should be used to prevent suction of soil into the RO-DRIP® outlets.

Proper preparation of soil and beds before planting is essential for successful crop production. Soil should be well worked, free of clods, and cross ripped when dry to assure adequate drainage and aeration. Care should be taken to avoid reforming hard pans. High beds provide improved drainage. Increasing bed height may help to alleviate drainage problems in problem soils.

Protect RO-DRIP® by storing in a protected area and leave wrapping in place until ready to install.

Always install RO-DRIP® lateral with orifice (outlet) facing up. This prevents potential plugging by any debris or contaminants that may enter or settle in the lateral.

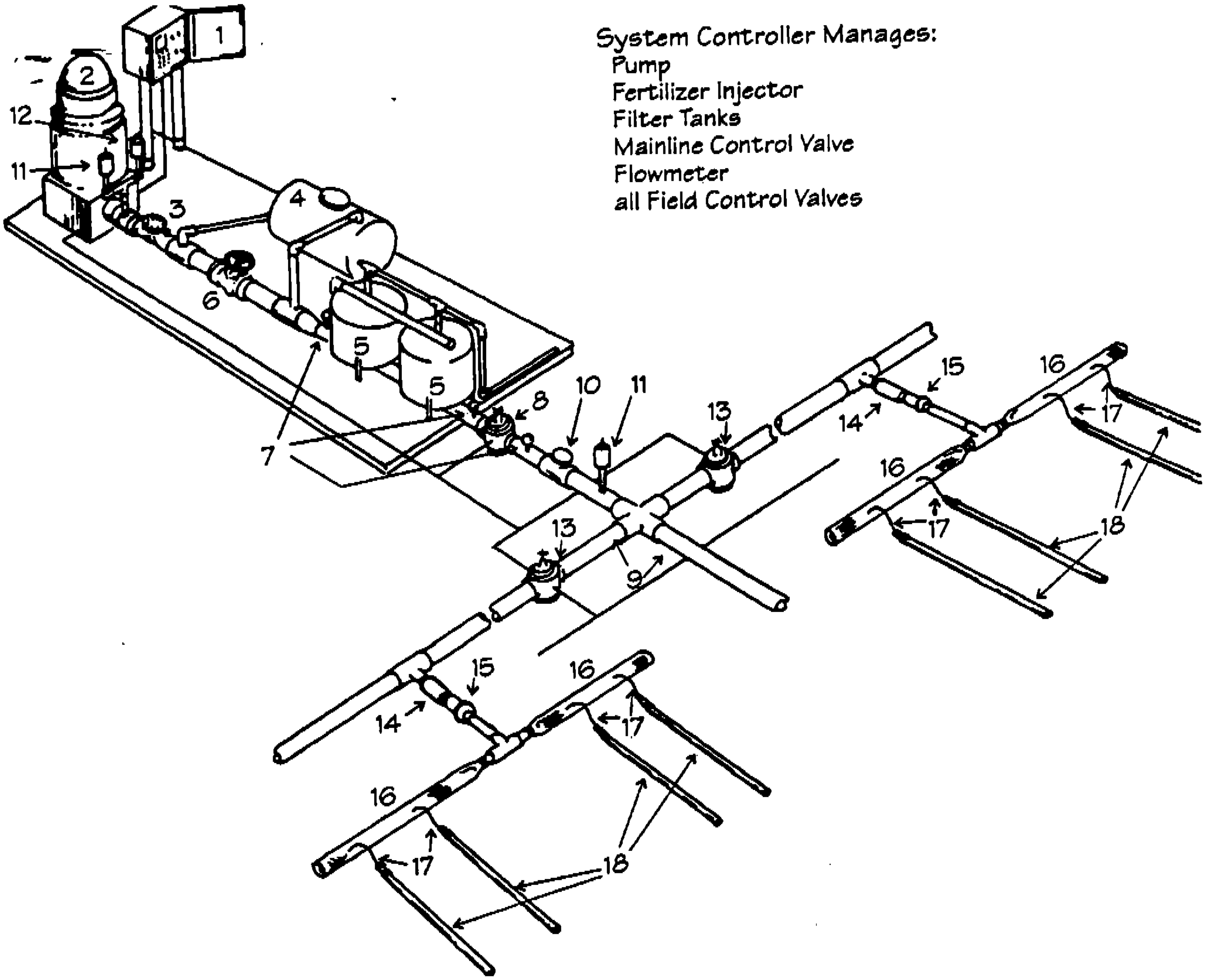
Do not step on RO-DRIP® laterals or drag the RO-DRIP® across soil surface. Puncture damage will alter flow rates.

RO-DRIP® must be buried when installed under clear plastic.

Maintain a low constant tension on the RO-DRIP® roll. Uneven tension or jerks could cause damage (stretch) and alter flow rates.

When RO-DRIP® spool is empty replace with a new roll and join ends together with a splice to prevent debris entering the completed lateral.

All systems should be operated before any planting begins.



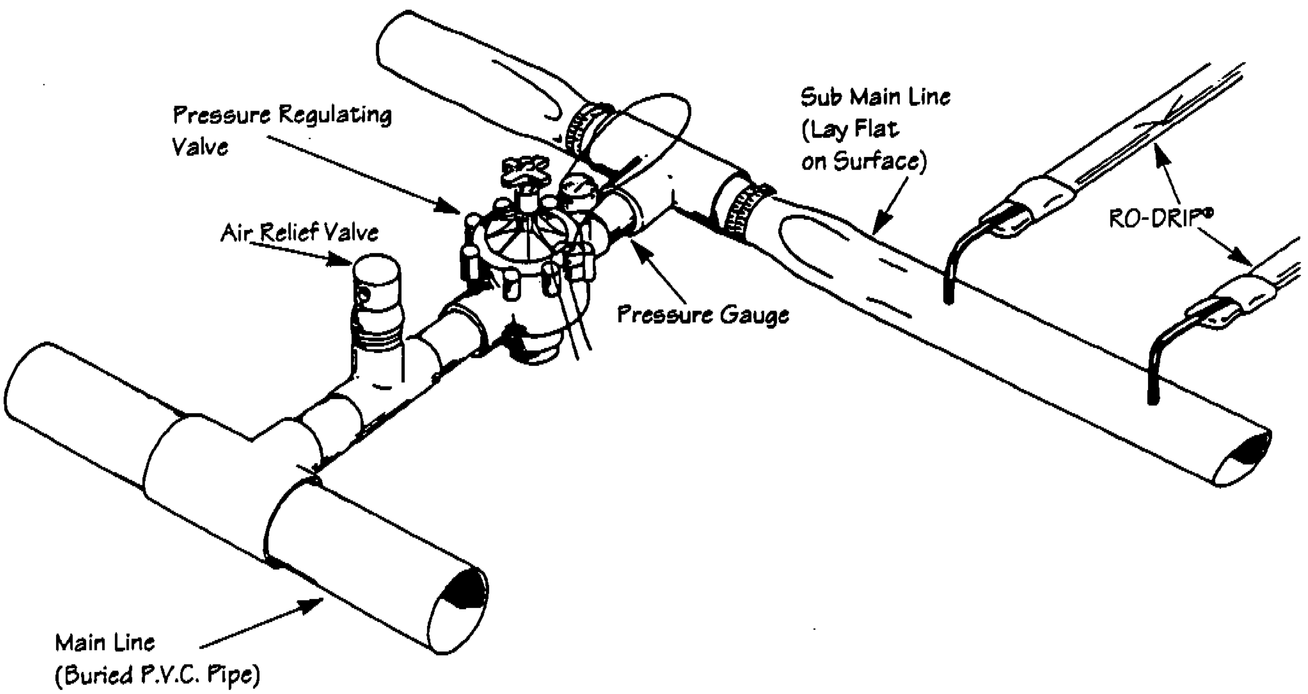
Equipment

All RO-DRIP® Irrigation Systems have common components:

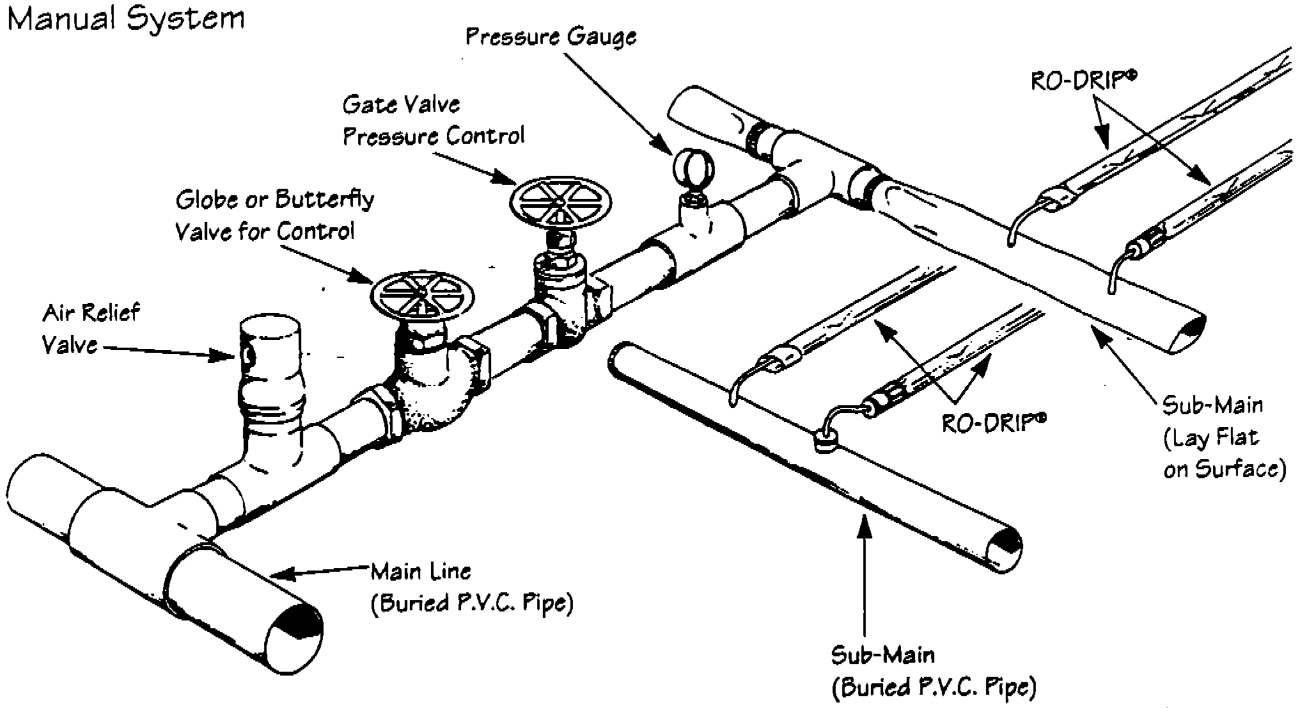
1. System Controller
2. Pump
3. Back Flow Prevention Valve
4. Fertilizer Injector or Tank
5. Filter Tanks
6. Gate or Geared Valve
7. Pressure Gauges
8. Mainline Control Valve
9. Mainline
10. Flowmeter
11. Air Vents at all High Points
12. Pressure Relief Valve
13. Field Control Valve
14. Sub-Main Secondary Filters
15. Pre-set Pressure Regulator
16. Sub-Main
17. Lateral Hookups
18. RO-DRIP® Laterals

Connection of Control Valve to Sub-Main

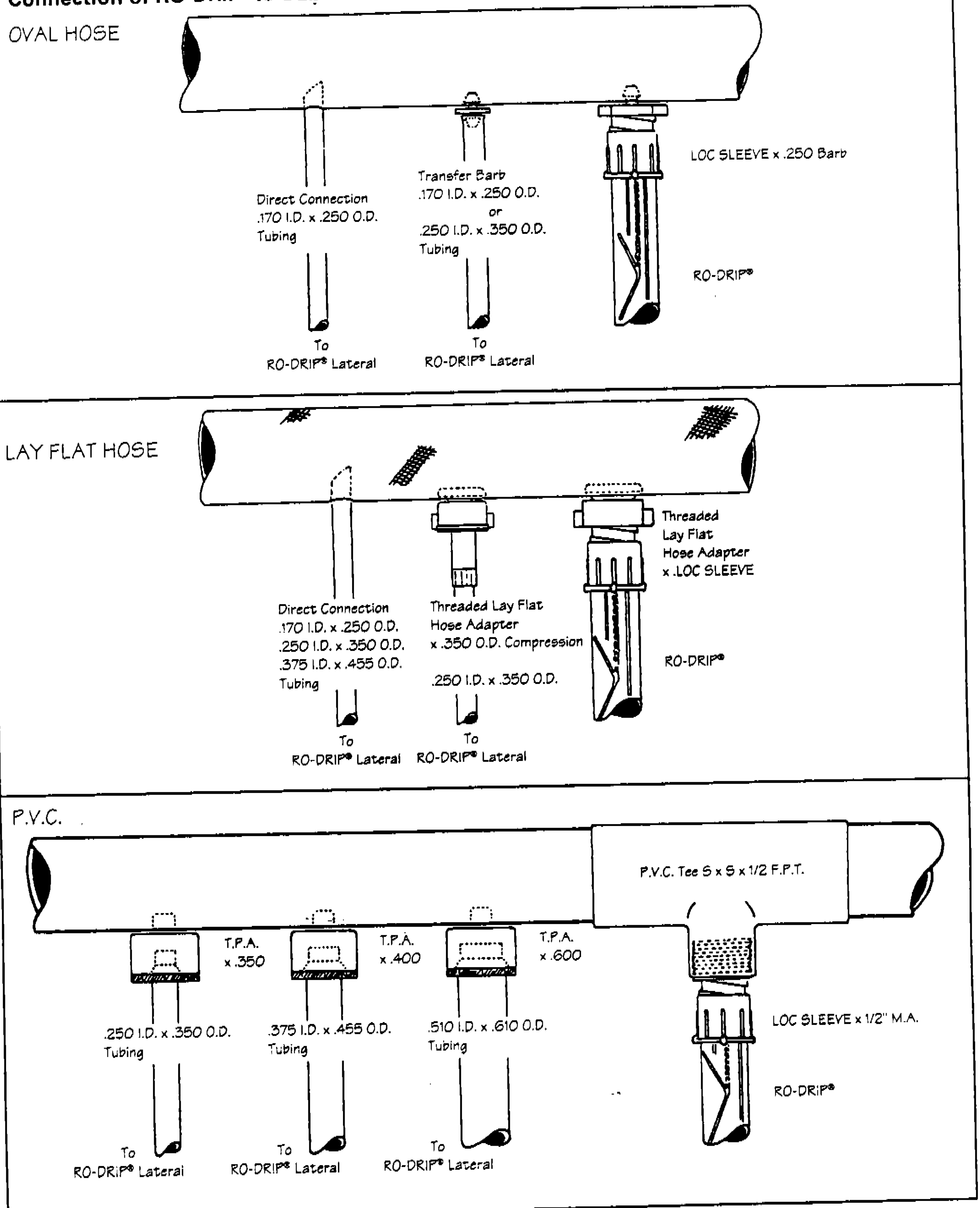
Automatic System



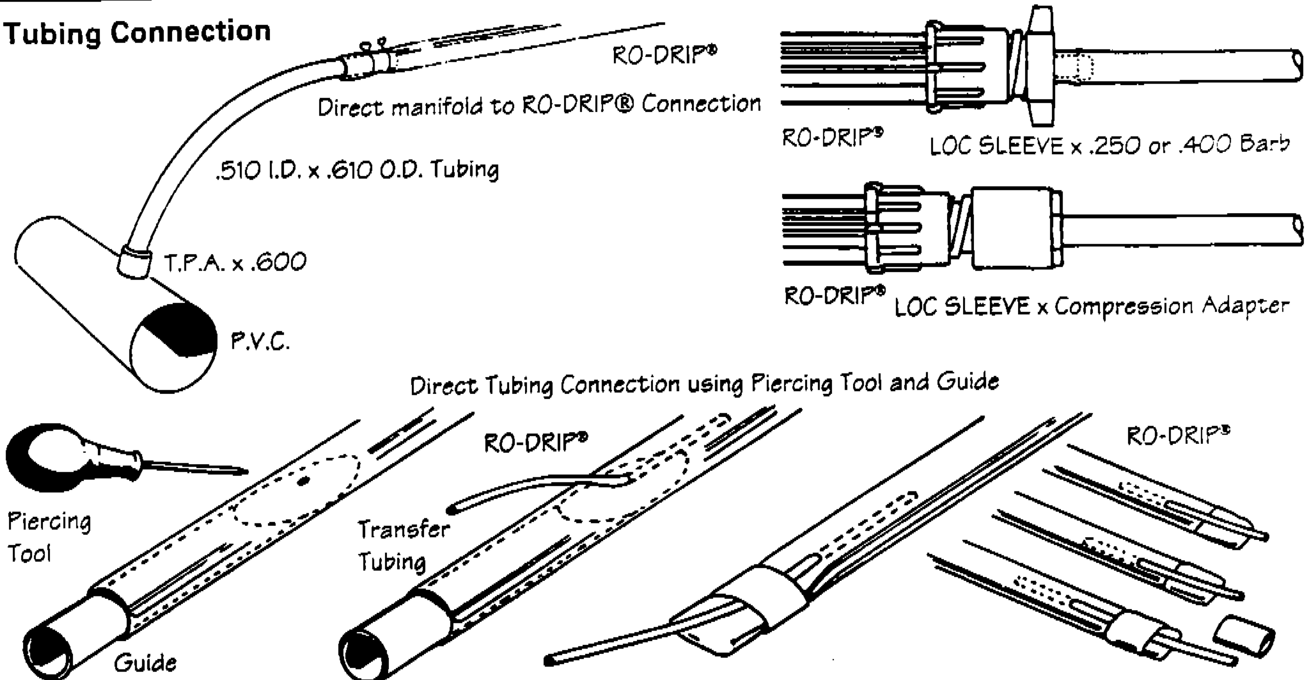
Manual System



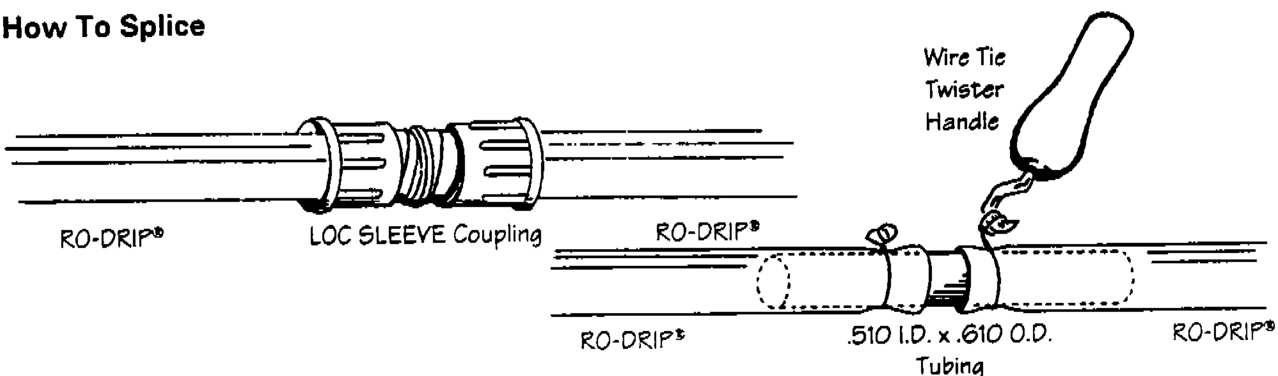
Connection of RO-DRIP® to Sub-Main



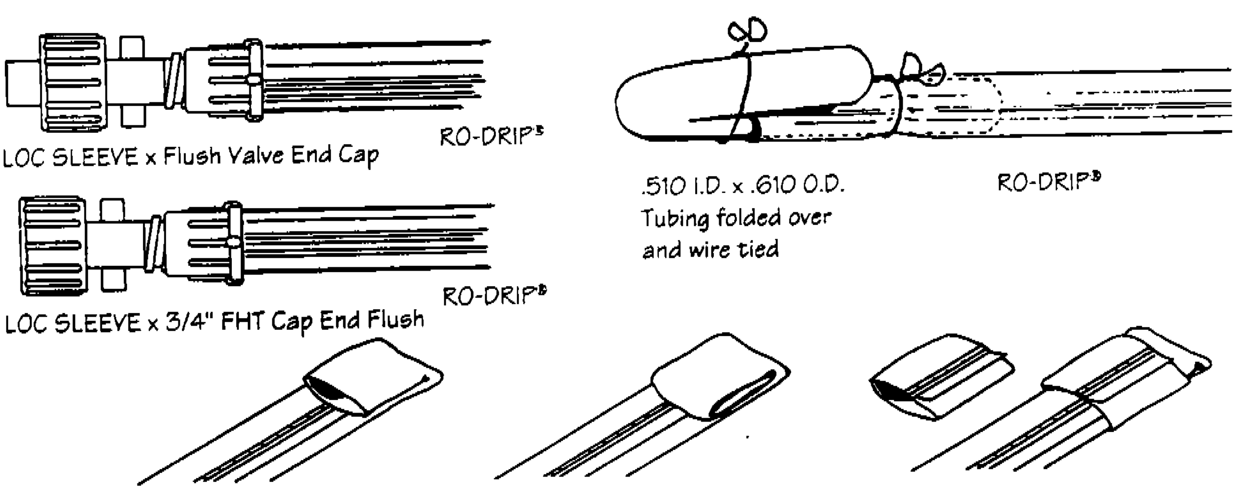
Tubing Connection



How To Splice



Closing Methods



Closing RO-DRIP® by folding over twice and sliding cut piece over folded end of RO-DRIP®

Factory Mutual System Approved

Buildings and Secondary Containment Products for Chemicals and Hazardous Materials

Achieve Regulatory Compliance for Hazardous Material Storage

Manufacturer's Representative

Anne E. Kramer
Petro-Chem Equipment Co.
800 330-6949

SAFETY STORAGE INC.

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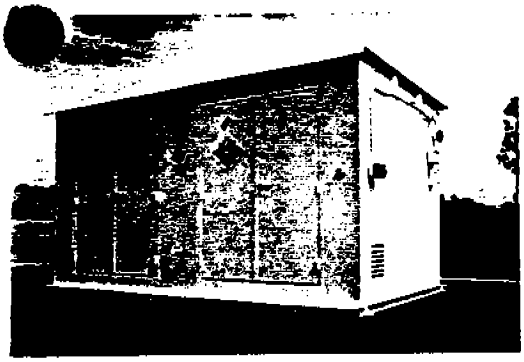
Suite 130
Tampa, FL 33610
813/621-6949
FAX: 813/626-5468



Steel and 2-Hour Fire-Rated Prefabricated Storage Buildings

Safety Storage™ prefabricated, weather-proof buildings offer a low cost solution to protect your facility from chemical hazards, provide secondary containment for soil and groundwater protection, minimize liability, meet fire safety needs, and safeguard personnel, while complying with federal, state, and local requirements.

These relocatable, turnkey buildings are available in a wide choice of building sizes and storage capacities, at a potential 60% savings over the cost of permanent structures. They are designed to Factory Mutual System standards and utilize UL listed components throughout.

Safety Storage buildings are designed to comply with all federal, state, and local regulations and can be pre-engineered to meet special structural, electrical, fire, and ventilation requirements.

Safety Storage is the nation's leading manufacturer of prefabricated chemical and hazardous material storage buildings. Custom engineering assistance and special application buildings are offered to meet specific requirements.

FEATURES

Steel Buildings

- Walls and sump walls constructed of 10-gauge welded steel
- Roof/ceiling constructed of 12-gauge steel
- Double-doors

FireShield Buildings

- Two-hour fire-rated walls, roof/ceiling, and sump walls, in accordance with UL 263 and ASTM-E119 requirements.
- Air inlet vents equipped with 1½ hour UL Classified fire dampers
- UL Classified three-hour fire-rated double doors (60"x80") with UL listed frame and hardware. Active door equipped with automatic door closer, security lock, and interior safety release

All Buildings

- Chemical resistant coated surfaces
- Water sprinkler piping assembly
- Secondary containment sump, with fiberglass floor grating
- Open-channel construction for visual inspection and crane/forklift openings
- Security locks with inside safety release
- Static grounding system
- Forklift pockets for ease of relocation
- Hold-down brackets
- Hazard placards and labeling
- One-year limited warranty

OPTIONS

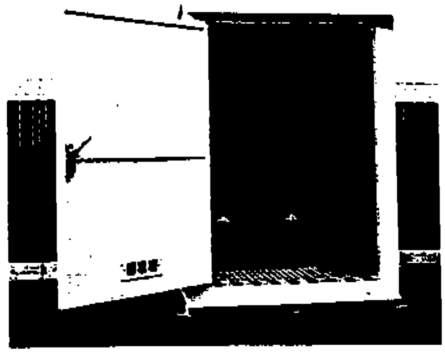
- UL listed interior and exterior lighting (Class I, Division 1)
- Heating and air conditioning systems (Class I, Division 1)
- Thermostatic control switches
- Electromechanical exhaust ventilation systems (Class I, Division 1)
- Liquid level detectors (Class I, Division 1)
- Dry chemical fire suppression system
- Interior separation wall(s), steel and 2-hour fire-rated
- Chemical resistant sump liner
- Explosion relief construction
- Safety eye/face wash units
- Sump overflow pipe fitting with cap
- Shelving
- Loading ramp(s)

Model	Outside Dimensions			Inside Dimensions			Tare Weight (Lbs.)	Door Openings		Designed Storage Capacity			Sump Capacity (Gallons)
	Length*	Width	Height	Length	Width	Height		Height	Width	Weight (lbs.)	Sq. Ft.	Drums**	
32	33'3¾"	11'5¼"	8'8"	32'7½"	10'8¼"	7'3¼"	23,325	6'7⅜"	4'10¾"	87,125	348	80	1460
24	25'3¾"	11'5¼"	8'8"	24'7½"	10'8¼"	7'3¼"	17,600	6'7⅜"	4'10¾"	65,750	263	60	1100
22	23'3¾"	9'3¾"	8'8"	22'7½"	8'9¼"	7'3¼"	16,750	6'7⅜"	4'10¾"	49,500	198	50	830
15	15'11¾"	9'3¾"	8'8"	15'3½"	8'9¼"	7'3¼"	8,775	6'7⅜"	4'10¾"	33,500	134	33	560
7	8'7¾"	9'3¾"	8'8"	7'11¼"	8'9¼"	7'3¼"	5,250	6'7⅜"	4'10¾"	17,375	69	16	290
10	10'11"	6'5"	8'4"	10'4"	5'9¼"	7'	2,600	6'9½"	9'1"	14,875	59	14	220
32FS	33'3¾"	11'5¼"	8'8"	32'	10'	7'1"	35,300	6'7⅜"	4'10¾"	80,000	320	80	1340
24FS	25'3¾"	11'5¼"	8'8"	24'	10'	7'1"	26,575	6'7⅜"	4'10¾"	60,000	240	60	1000
22FS	23'3¾"	9'3¾"	8'8"	21'11½"	8'1¼"	7'1"	24,025	6'7⅜"	4'10¾"	44,500	178	44	750
15FS	15'11¾"	9'3¾"	8'8"	14'7½"	8'1¼"	7'1"	13,975	6'7⅜"	4'10¾"	29,625	118	28	500
7FS	8'7¾"	9'3¾"	8'8"	7'3½"	8'1¼"	7'1"	8,125	6'7⅜"	4'10¾"	14,760	59	12	250
10FS	10'11"	6'5"	8'4"	9'8"	5'1¼"	6'10"	8,000	6'7⅜"	4'10¾"	11,000	44	8	160

**Includes hold-down brackets. **55 gallon drums.*

Chemical Storage Buildings and Lockers Models 6 and 2

Buildings for the storage of chemicals and other hazardous materials in smaller quantities. These buildings are in full compliance with federal, state, and local regulations.



FEATURES

- Constructed of ASTM-graded steel
- Secondary containment sump with fiberglass floor grating
- Chemical resistant coated surfaces
- Natural ventilation
- Security locks with interior safety release
- Static grounding system
- Forklift pockets for ease of relocation
- Hold-down brackets
- Hazard placards and labeling
- One-year limited warranty

OPTIONS

- Safety eye/wash unit
- Chemical resistant sump liner
- Interior/exterior lighting
- Electromechanical exhaust ventilation system (Model 6 only)
- Dry chemical fire suppression system (Model 6 only)
- Sump overflow fitting with cap
- Shelving

Model	Outside Dimensions			Inside Dimensions			Tare Weight (Lbs.)	Door Openings		Designed Storage Capacity			Sump Capacity (Gallons)
	Length*	Width	Height	Length	Width	Height		Height	Width	Wt. (lbs.)	Sq. Ft.	Drums**	
6	6'3¾"	6'7"	8'4"	5'8¼"	5'9¼"	7'	1,800	6'9"	4'6"	8,000	32	5	122
2	5'3"	2'10½"	6'	4'8"	2'5"	4'6"	650	4'5"	4'4"	2,800	11	2	86

*Includes hold-down brackets. **55 gallon drums.*

4-Hour Fire-Rated Buildings for Flammable and Combustible Liquids and Hazardous Materials

Heavy-duty, relocatable Safety Storage™ buildings which comply with Underwriters Laboratories U435 (4-hour) fire-rating classification and meet applicable regulatory requirements for safe storage, handling, dispensing, and use of flammable and combustible liquids and hazardous materials.

The buildings, which are available in three standard sizes, may be located less than five feet from a structure or property line. They may even be placed inside your facility (subject to local authority having jurisdiction).

FEATURES

- Four-hour fire-rated walls, roof/ceiling, and sump walls constructed of gypsum encased in galvanized steel sheeting per UL Fire Resistance Rating Design No. U435
- Three-hour, UL Classified double doors with UL listed frame and hardware
- Air inlet vents equipped with 3-hour, UL Classified fire-rated dampers
- Secondary containment sump with fiberglass grating
- Chemical resistant coated surfaces
- Security locks with inside safety release
- Static grounding system
- Forklift pockets for ease of relocation
- Hold-down brackets
- Hazard placards and labeling
- One-year limited warranty

OPTIONS

- Heating, air conditioning, and electro-mechanical exhaust ventilation systems (Class I, Division 1)
- Interior/exterior lighting (Class I, Division 1)
- Dry chemical fire suppression system
- Liquid level detectors (Class I, Division 1)
- Emergency eye/face wash units
- Interior walls and shelving
- Loading ramps

Model	Outside Dimensions			Inside Dimensions			Tare Weight (Lbs.)	Door Openings		Designed Storage Capacity			Sump Capacit[illegible] (Gall[illegible]
	Length*	Width	Height	Length	Width	Height		Height	Width	Wt. (lbs.)	Sq. Ft.	Drums**	
44-4	33'6½"	9'2⅞"	8'9⅛"	21'11½"	8'	7'4"	31,125	6'7⅜"	4'10¾"	44,000	176	44	750
30-4	16'3½"	9'2⅞"	8'9⅛"	14'7½"	8'	7'4"	21,725	6'7⅜"	4'10¾"	29,625	118	28	600
14-4	8'10¾"	9'2⅞"	8'9⅛"	7'3"	8'	7'4"	12,300	6'7⅜"	4'10¾"	14,750	59	12	250

*Includes hold-down brackets. **55 gallon drums.*

SAFETY STORAGE™ Secondary Containment Products

Hazardous Liquid Spill Containment Sump

Safety Storage Spill Containment Sumps provide secondary containment storage for hazardous chemicals. The sumps are available in five standard sizes to accommodate up to eighty 55-gallon drums and have a spill capacity of up to 1460 gallons. They may be used inside or outside with a minimum of site preparation.

FEATURES

- Constructed of continuously welded 10-gauge steel
- Chemical resistant coated surfaces
- Fiberglass floor grating
- Forklift pockets for ease of relocation
- Static grounding system

OPTIONS

- Sump overflow fitting with cap
- Chemical resistant sump liner

Model	Outside Dimensions			Storage Capacity Max.		Sump Capacity Gallons	Tare Weight (Lbs.)
	Length*	Width	Height	Sq. Ft.	Drums**		
32S	33'3½"	11'1¾"	11⅛"	371	80	1460	6140
24S	25'4½"	11'1¾"	11⅛"	283	60	1100	4610
22S	22'6⅛"	8'6½"	11⅜"	177	40	770	3085
15S	15'6¼"	8'6½"	11⅜"	121	28	520	2070
7S	7'9¼"	8'6½"	11⅜"	59	12	250	1050

**Includes hold-down brackets. **55 gallon drums.*

SAFE-T-PALLET™ Spill Containment Pallets

Steel

FEATURES

- Constructed of 10-gauge ASTM-A569 sheet steel and ASTM-A36 tubing
- Dimensions: 52"L x 52"W x 16½"H
- Storage capacity: four (4) 55-gallon drums (single level)
- Sump capacity: 127 gallons
- Fiberglass floor grating
- Chemical resistant coated surfaces
- Forklift pockets for ease of relocation

OPTIONS

- Chemical resistant sump liner
- Sump overflow fitting with cap
- Side rails and safety chains

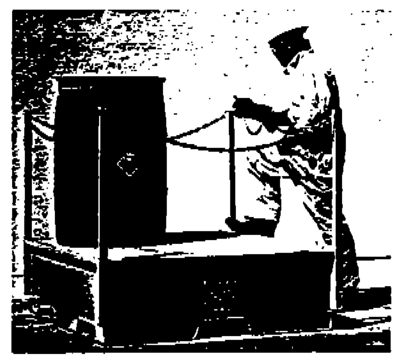
Molded Polyethylene

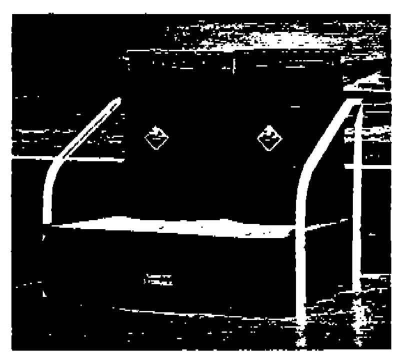
FEATURES

- Constructed of rotationally-molded, high-density, corrosion-resistant, cross-linked polyethylene
- Dimensions: 52"L x 52"W x 16½"H
- Storage capacity: four (4) 55-gallon drums (single level)
- Sump capacity: 90 gallons
- Fiberglass floor grating
- Forklift pockets for ease of relocation

OPTIONS

- Side rails and safety chains
- Steel floor grating





Factory Mutual System Approved* UL CLASSIFIED

** Factory Mutual approval is pending on some products. Usage is subject to local authority having jurisdiction. UL classification not available on all models.*

SAFETY STORAGE™

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SAFETY STORAGE INC.

Represented by:
Petro-Chem Equipment Co.
8302 Laurel Fair Circle. #130
Tampa. FL 33610-7361
813/621-6949 . FAX: 813 626-5468
1-800/330-6949

HAZARDOUS MATERIALS STORAGE BUILDING SPECIFICATION
MODEL 15 SAFETY STORAGE BUILDING

BASIC STRUCTURE

* Relocatable hazardous materials storage unit.
* External dimensions: 16'0" L x 9'4" W x 8'8" H
* Internal dimensions: 15'3" L x 8'9" W x 7'3" H
* Interior Square Footage: 134 square feet
* Storage capacity: 28 55-gallon drums or 33,500 lbs.
* Building Walls: noncombustible, 10 gauge, corrosion protected sheet steel welded to 10 gauge, corrosion protected, formed steel studs.
* Roof: noncombustible, 12 gauge, corrosion protected, sheet steel continuously welded to 10 gauge, corrosion protected, formed steel purlins on 30 inch centers. Roof is sloped for rain water run-off.
* No mechanical fasteners penetrate the exterior walls or roof.
* No lightweight steel skins, plywood, or rubber membranes are used in wall or roof construction.
* Roof snow loading: 40 psf
* Wind loading: 30 psf (110 mph)
* Doors: Two (2) 55-1/2" W x 82-1/2" H Located on front of building. Fabricated from twelve gauge (12 ga) corrosion-protected sheet steel is equipped with a three-point security lock and an interior safety release latch. Door opening measures (54"W x 81"H).
* Building base: open channel construction, providing visual inspection of bottom and crane/forklift pockets for ease in relocation.
* Tare weight: approximately 8,775 lbs.

SECONDARY CONTAINMENT SUMP/FLOORING

* Built-in seven-inch deep secondary spill containment sump with chemical resistant epoxy coating.
* Sump Construction: noncombustible, 10 gauge, corrosion protected, sheet steel floor continuously welded at perimeter to 10 gauge, corrosion protected, steel walls.
* Sump capacity: 560 gallons (30% of total storage capacity of building).
* Flooring: Pultruded, corrosion and ultraviolet (UV) resistant, "T-bar" fiberglass grating made with fire retardant, isophthalic polyester resin and permanently bonded quartz grit/baked epoxy anti-skid surface with an 35% open area. Grating is installed in removable sections to enable easy access to sump. Gap between bars does not exceed one inch.
* Floor loading: 250 psf

FIRE SPRINKLER ASSEMBLY

* Fire engineered water sprinkler piping assembly with two (2) UL listed, FM approved star sprinkler heads and 1-1/2 inch NPT exterior coupling.

HAZARDOUS MATERIALS STORAGE BUILDING SPECIFICATION
MODEL 15 SAFETY STORAGE BUILDING

ADDITIONAL STANDARD FEATURES

* Interior finish: high solids, chemical resistant epoxy undercoat (5 mils DFT) with off-white semi-gloss finish
* Exterior finish: high solids, chemical resistant epoxy undercoat (5 mils DFT) with heat reflective, UV resistant, gloss-white aliphatic polyurethane topcoat (3 mils DFT).
* Signs: One (1) permanent, all-metal D.O.T. flip placard and one (1) pressure sensitive NFPA 704 hazard rating sign on each door.
* Grounding system: Static grounding system with interior grounding lugs, one (1) exterior static grounding connection, and one (1) eight-foot long copper clad steel grounding rod.
* Anchoring: Four (4) hold-down brackets for anchoring building.
* Air vents: Air inlet vents on sides of building.

ELECTRICAL SYSTEM

* Pre-wired electrical system including necessary breaker panels, relays, and switches. All components UL labeled.
* All interior components explosion-proof, Class I, Division 1.
* One (1) UL listed, weatherproof load center (NEMA 3R) with appropriate circuit breakers.

LIGHTING

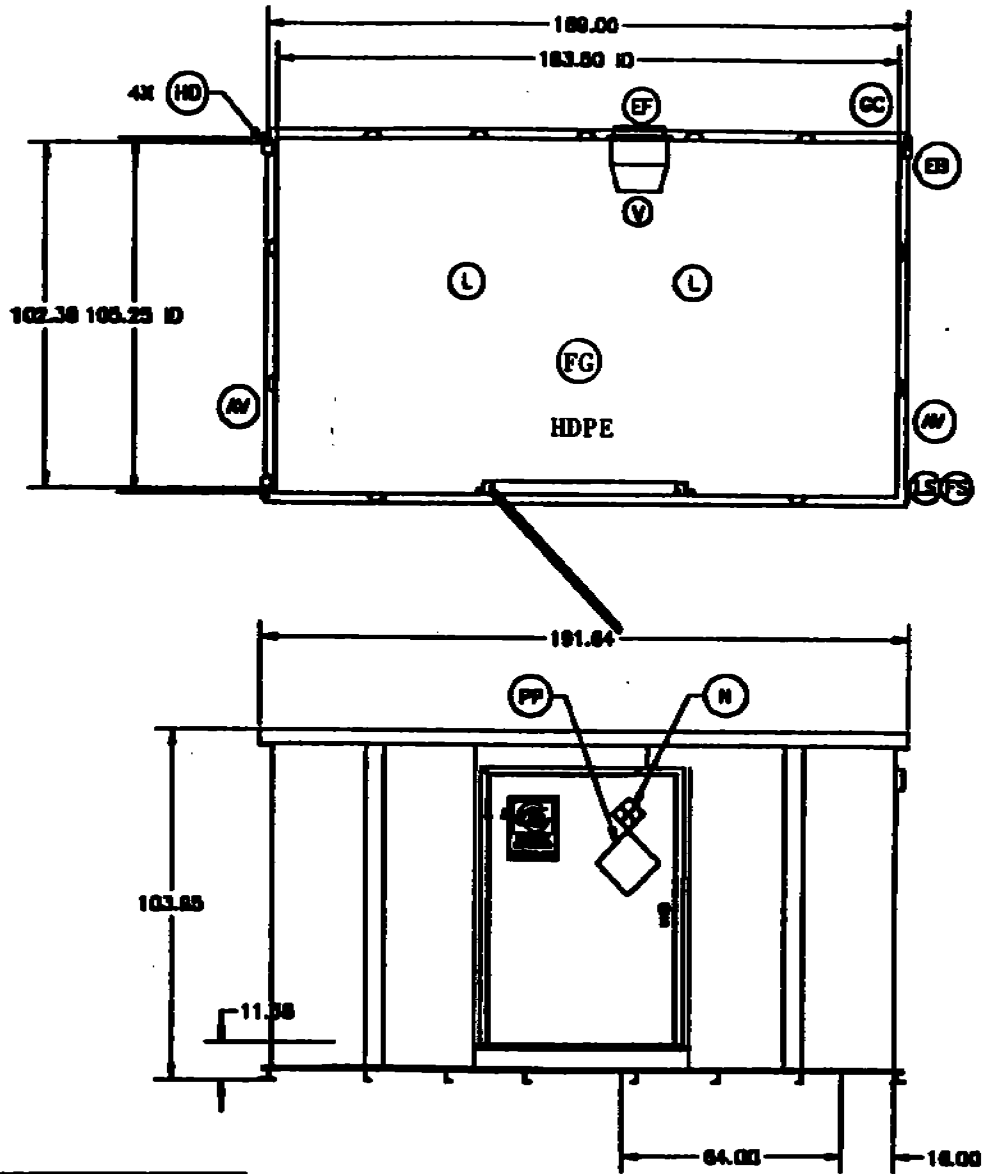
* Two (2) interior, UL listed, Class I, Division 1, Groups C and D, explosion proof incandescent lighting fixtures each with a 150 W lamp (120 V, 1.25 A, single phase) and one exterior, Class I, Division 1, Groups C and D, hazardous location light switch (NEMA enclosure type 7/3).

ELECTRO-MECHANICAL VENTILATION SYSTEM

* One (1) explosion proof motorized ventilation system equipped with one (1) UL listed, Class I, Division 1, Group D, totally enclosed motor (120 V, 4.5 A, 60 Hz, single phase) with non-sparking 12 inch diameter, cast aluminum fan blade. System is controlled by one (1) exterior UL listed, Class I, Division 1, Groups C and D, hazardous location fan switch (NEMA enclosure 7/3). System air-intake is located within twelve inches of flooring to minimize accumulation of hazardous vapors and system discharge located near top of building to maximize hazardous vapor dispersion. Exterior exhaust fan port opening is protected by a shutter assembly. All ducting is constructed of 12 gauge steel and coated with epoxy both inside and out. Ventilation system provides a minimum of six air changes per hour and will shutdown automatically in case of fire.

SUMP LINER

* High density polyethylene (HDPE) liner in sump area for added chemical resistance when storing corrosives.



LEGEND

AIV: AIR INLET VENT
EB: ELECTRICAL BREAKER ([illegible] AMP)
EF: EXHAUST FAN (12") (CLASS 1, DIV. 1)
FS: FAN SWITCH
GC: GROUNDING CONNECTION
HD: HOLD-DOWN BRACKET
L: EXPLOSION PROOF LIGHT (CLASS I, DIVISION I)
LS: LIGHT SWITCH
N: [illegible]
PP: PERMANENT ELEC. PLACARD
V: VENT FOR FUME REMOVAL

HDPE: POLYETHYLENE SUMP LINER
FG: FIBERGLASS FLOOR GRADING

NOTES: ____________________

BLDG #: ____________________
CUSTOMER
ADDRESS: ____________________

CONTACT:

SAFETY STORAGE

MODEL 15

ACCEPTED SIGNATURE: ____________________

INTERNAL USE ONLY
RELEASED: __________
COMPLETE BY: __________

The MODRET computer program was used to model the mounding effects of infiltration from the proposed oxygen/nutrient delivery system on the groundwater table. MODRET is, in effect, a preprocessor for the USGS model MODFLOW as applied to this particular situation. MODFLOW is a widely accepted groundwater flow model. The MODRET program takes user supplied data and formats it to the MODFLOW input requirements. This data includes the infiltration system geometry, the horizontal hydraulic conductivity, the soil's effective storage coefficient, the aquifer's saturated thickness, the infiltration system's elevation relative to the water table, and the storage coefficient of the media surrounding the infiltration system's piping.

Since MODRET was primarily written for the analysis of groundwater mounding resulting from infiltration from a stormwater retention pond, the printout is tailored for that situation and therefore contains information that is irrelevant to other situations. The MODRET output is discussed below.

1. The output begins with a reiteration of the input data. For non-circular ponds or trenches the geometry is given as an average length and width which represents the same bottom area as the actual pond or trench. For circular ponds, an equivalent average length and width is calculated and used.

2. The relative elevations of the bottom of the aquifer, the design groundwater table, and the pond or trench bottom are then given.

3. The design pond overflow elevation is then given. If no overflow exists, this value will be "-1". No overflow structure will normally be present for an infiltration system, but a recovery trench would require an overflow to provide a means of removing the recovered groundwater.

4. The hydraulic conductivity and soil storage coefficient are then given.

5. The average storage coefficient of the pond or system media is given last. For open ponds, this will be "1". For infiltration or recovery systems, this will be the storage coefficient of the media which surrounds the distribution or collection piping, typically between 0.4 and 0.5.

6. Following the input data is a table which summarizes the influent rate to the pond or system. The modeled time duration is broken down into "stress periods". Each stress period represents some specified length of time during which the influent to the pond or system is constant. For each stress period, the table gives the length of time, recharge rate to the pond or system (hydraulic loading), and the recharge rate to areas outside the pond or system (this was provided so that rainfall around a stormwater retention pond could be considered in evaluating the pond's performance). Stress periods can be created to define changing input conditions as described above, or to provide output at specified time intervals in order to see the incremental changes which may have occurred or to establish that the groundwater table has stabilized.

7. Storage and infiltration volumes for retention ponds follow the influent summary table. These are not important to infiltration systems with constant inflows or to recovery trenches.

8. The elevation of water in a pond that would result from the given inflow if no infiltration occurred is given for each stress period. This is only used in the evaluation of retention pond performance and has no meaning for most infiltration systems and recovery trenches.

9. A summary of the MODRET results is then given which includes the groundwater table elevation at the end of each stress period. The infiltration rate is also given. For infiltration systems with constant inflow rates, this value should equal the inflow rate. For recovery trenches, this value would be negative since water would be removed from the aquifer, and would equal the trench withdrawal rate.

10. Profile data for the end of each stress period is then given for the groundwater mound (or depression in the case of a recovery trench). A diagram is shown indicating that the profile data refers to a coordinate system with it's origin at the geometric center of the pond or trench, with the long dimension being the "y" direction and the short dimension being the "x" direction. In both infiltration systems and recovery trenches, the "x" direction is considered representative of the mound or depression influence. Changes in the mound or depression over time can be seen in this profile data from stress period to stress period.

MODEL SETUP AND INPUT

The infiltration system will consist of a piping network designed to evenly distribute 30,000 gallons per day over the source area, which is roughly circular. Therefore, the infiltration system was treated as a circular pond with a diameter of 130 feet. This geometry most accurately reflects the system's proposed functions for modeling purposes. The water table is assumed to be four feet below land surface (bls) and the aquifer bottom is assumed to be 70 feet bls. The bottom of the infiltration system will be two feet bls. The horizontal hydraulic conductivity and the soil storage coefficient, 21 feet per day and 0.25, respectively, are given in the Contamination Assessment Report. The simulation does not include effects from the existing groundwater gradient, natural water table elevation fluctuations, or subsurface structures, such as the original Alpha bulkhead, which restrict groundwater flow.

MODRET PROGRAM PRINTOUT

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                    SATURATED INFILTRATION ANALYSIS
                        USING 'MODRET ' PROGRAM

                    Written By Nicolas E. Andreyev,P.E.
                            ( March, 1989 )

                       SUMMARY OF INPUT PARAMETERS
                       ===========================

POND NAME / NUMBER : Alpha Delta Piers Bioremediation System

AVERAGE WETTED POND LENGTH ====================>   115.210 ft

AVERAGE WETTED POND WIDTH =====================>   115.210 ft

AVERAGE ELEVATION OF BOTTOM OF AQUIFER ========>   -60.000 ft

AVERAGE ELEVATION OF DESIGN GROUNDWATER TABLE =>     6.000 ft

AVERAGE ELEVATION OF POND BOTTOM ==============>     8.000 ft

ELEVATION OF DESIGN OVERFLOW FROM POND ========>    -1.000 ft

AVERAGE HORIZONTAL HYDRAULIC CONDUCTIVITY =====>    21.000 ft/d

AVERAGE EFFECTIVE STORAGE COEFF. OF SOIL ======>     0.250

AVERAGE STORAGE COEFFICIENT OF POND AREA ======>     0.250
```

STRESS PERIOD No.	TIME INCREMENT (HOURS)	RECHARGE TO POND AREA (ft/day)	RECHARGE OUTSIDE POND AREA (ft/day)
1.00000	720.00000	0.30214	0.00000
2.00000	720.00000	0.30214	0.00000
3.00000	720.00000	0.30214	0.00000
4.00000	720.00000	0.30214	0.00000
5.00000	720.00000	0.30214	0.00000
6.00000	720.00000	0.30214	0.00000

THE TOTAL DIRECT STORAGE AND INFILTRATION VOLUME OF RETENTION POND DURING SATURATED INFILTRATION IS:

Vs = 16.57190 ac-ft

THE TOTAL STORAGE AND INFILTRATION CAPACITY OF RETENTION POND DURING 'UNSATURATED AND SATURATED' INFILTRATION IS:

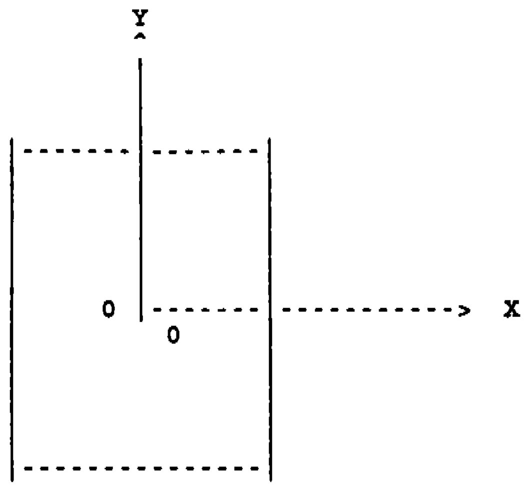
VT = Vu + Vs = 16.57190 ac-ft

STRESS PERIOD NUMBER	ELEVATION OF WATER LEVEL IF NO INFILTRATION OCCURRED (ft)
1	44.26
2	80.51
3	116.77
4	153.03
5	189.28
6	225.54

SUMMARY OF 'MODRET' RESULTS

POND NAME / No.: Alpha Delta Piers Bioremediation System

STRESS PERIOD	CUMULATIVE TIME (hrs.)	WATER ELEVATION (feet)	INFILTRATION RATE (cfs)	WEIR OVERFLOW (cubic ft.)
0	0.000	6.000	0.000	0.000
1	720.000	7.070	0.048	0.000
2	1440.000	7.240	0.046	0.000
3	2160.000	7.320	0.046	0.000
4	2880.000	7.320	0.046	0.000
5	3600.000	7.320	0.046	0.000
6	4320.000	7.320	0.046	0.000



SUMMARY OF GROUNDWATER MOUND

END OF STRESS PERIOD No. 1

X - COOR. (ft.)	ELEVATION (ft.)	Y - COOR. (ft.)	ELEVATION (ft.)
14.40	7.07	9.60	7.07
43.20	7.07	28.80	7.07
72.01	6.95	48.00	7.06
100.81	6.78	67.21	6.98
129.61	6.67	86.41	6.86
172.81	6.54	105.61	6.77
259.22	6.37	134.41	6.66
374.43	6.24	192.02	6.50
489.64	6.16	307.23	6.30
604.85	6.11	460.84	6.18
720.06	6.07	614.45	6.10
835.27	6.05	768.06	6.06
950.48	6.03	921.68	6.03
1065.69	6.01	1075.29	6.02
1180.90	6.00	1228.90	6.00

END OF STRESS PERIOD No. 2

X - COOR. (ft.)	ELEVATION (ft.)	Y - COOR. (ft.)	ELEVATION (ft.)
14.40	7.24	9.60	7.24
43.20	-7.24	28.80	7.24
72.01	7.13	48.00	7.24
100.81	6.96	67.21	7.16
129.61	6.85	86.41	7.04
172.81	6.72	105.61	6.95
259.22	6.53	134.41	6.84
374.43	6.37	192.02	6.67
489.64	6.27	307.23	6.46
604.85	6.19	460.84	6.29
720.06	6.14	614.45	6.19
835.27	6.09	768.06	6.12
950.48	6.06	921.68	6.07
1065.69	6.03	1075.29	6.03
1180.90	6.00	1228.90	6.00

END OF STRESS PERIOD No. 3

X - COOR. (ft.)	ELEVATION (ft.)	Y - COOR. (ft.)	ELEVATION (ft.)
14.40	7.32	9.60	7.32
43.20	7.32	28.80	7.32
72.01	7.20	48.00	7.31
100.81	7.04	67.21	7.24
129.61	6.93	86.41	7.12
172.81	6.80	105.61	7.03
259.22	6.61	134.41	6.93
374.43	6.45	192.02	6.76
489.64	6.33	307.23	6.54
604.85	6.25	460.84	6.36
720.06	6.18	614.45	6.25
835.27	6.13	768.06	6.16
950.48	6.08	921.68	6.10
1065.69	6.04	1075.29	6.05
1180.90	6.00	1228.90	6.00

END OF STRESS PERIOD No. 4

X - COOR. (ft.)	ELEVATION (ft.)	Y - COOR. (ft.)	ELEVATION (ft.)
14.40	7.32	9.60	7.32
43.20	7.32	28.80	7.32
72.01	7.20	48.00	7.31
100.81	7.04	67.21	7.24
129.61	6.93	86.41	7.12
172.81	6.80	105.61	7.03
259.22	6.62	134.41	6.93
374.43	6.45	192.02	6.76
489.64	6.34	307.23	6.54
604.85	6.25	460.84	6.37
720.06	6.18	614.45	6.25
835.27	6.13	768.06	6.17
950.48	6.08	921.68	6.10
1065.69	6.04	1075.29	6.05
1180.90	6.00	1228.90	6.00

END OF STRESS PERIOD No. 5

X - COOR. (ft.)	ELEVATION (ft.)	Y - COOR. (ft.)	ELEVATION (ft.)
14.40	7.32	9.60	7.32
43.20	7.32	28.80	7.32
72.01	7.20	48.00	7.31
100.81	7.04	67.21	7.24
129.61	6.93	86.41	7.12
172.81	6.80	105.61	7.03
259.22	6.62	134.41	6.93
374.43	6.46	192.02	6.76
489.64	6.34	307.23	6.55
604.85	6.26	460.84	6.38
720.06	6.19	614.45	6.26
835.27	6.13	768.06	6.17
950.48	6.08	921.68	6.11
1065.69	6.04	1075.29	6.05
1180.90	6.00	1228.90	6.00

END OF STRESS PERIOD No. 6

X - COOR. (ft.)	ELEVATION (ft.)	Y - COOR. (ft.)	ELEVATION (ft.)
14.40	7.32	9.60	7.32
43.20	7.32	28.80	7.32
72.01	7.20	48.00	7.31
100.81	7.04	67.21	7.24
129.61	6.94	86.41	7.12
172.81	6.81	105.61	7.03
259.22	6.62	134.41	6.93
374.43	6.46	192.02	6.76
489.64	6.35	307.23	6.55
604.85	6.26	460.84	6.38
720.06	6.19	614.45	6.26
835.27	6.13	768.06	6.18
950.48	6.09	921.68	6.11
1065.69	6.04	1075.29	6.05
1180.90	6.00	1228.90	6.00

DISCUSSION OF RESULTS

The model results show that the groundwater table can be expected to mound about 1.32 feet over the first three months and then stabilize. Although the model does not rigorously simulate all of the expected site conditions, the results are considered sufficient for a preliminary analysis. The primary concern with regard to groundwater mounding, is its potential effect on the pavement at the site. The preliminary analysis indicates that the top of the mound will be sufficiently below the pavement and sub-base to avoid any negative effects.

The groundwater mounding which is expected to result from the source area treatment will tend to push the edge of the contaminant plume further down gradient. To offset this effect, a perimeter treatment system is proposed. The system will consist of a series of shallow dosing wells which will create a biological treatment "fence" by the controlled release of oxygen into the groundwater as it moves down gradient.

Assuming all of the groundwater contamination not treated by the source area system will move through the perimeter system and that the source area is treated to 100 ppm, the geometric average TRPH concentration crossing the perimeter would be:

$$\sqrt[3]{5 \times 50 \times 100} = 29 \; ppm$$

Based on the contours shown in Figure 3-2 and assuming the contaminant concentrations exceeding the target levels occur within the upper 5 feet of the aquifer, the volume of contaminated groundwater to be treated is:

$$31{,}769 \; ft^2 \times 5 \; ft \times 0.25 \; porosity = 39{,}711 \; ft^3 = 297{,}061 \; gallons$$

Therefore, the amount of TRPH to be degraded is:

$$297{,}061 \; gal \times (29 - 5) \; \frac{mg}{l} \times 3.785 \; \frac{l}{gal} \times 0.001 \; \frac{g}{mg} = 26{,}985 \; g \; of \; TRPH$$

Groundwater at the site will ultimately flow to the east. Based on Figures 3-2 and 4-2, the plume is expected to pass through about 150 feet of the down gradient perimeter. Using a calculated pore water velocity of 0.59 ft/day and a thickness of contaminated aquifer of 5 feet, the volume of contaminated groundwater passing through the perimeter system will be:

$$150 \; ft \times 5 \; ft \times 0.59 \; \frac{ft}{day} = 442.5 \; \frac{ft^3}{day} = 3310 \; gpd$$

The TRPH to be treated will be:

$$3310 \; gpd \times 3.785 \; \frac{l}{gal} \times 24 \; \frac{mg \; of \; TRPH}{l} \times 0.001 \; \frac{g}{mg} = 301 \; \frac{g \; of \; TRPH}{day}$$

The oxygen required to treat the TRPH will be:

$$2.5 \; \frac{g \; of \; O_2}{g \; of \; TRPH} \times 301 \; \frac{g \; of \; TRPH}{day} = 752.5 \; \frac{g \; of \; O_2}{day}$$

The oxygen source will be a slow dissolving powder of MgO_2. The rate of release of oxygen is 1.8 mg of O_2 per day for each gram of MgO_2. Therefore, the amount of powder required is:

$$\frac{752.5 \ \frac{g\ of\ O_2}{day}}{1.8 \ \frac{mg\ of\ O_2}{g\ of\ MgO_2}} \times 1000 \ \frac{mg}{g} \times 0.001 \ \frac{kg}{g} = 418 \ kg\ of\ MgO_2$$

A dosing well spacing of 5 feet is assumed based on a conservative estimate of lateral spreading due to mechanical dispersion. At that spacing, 30 wells will be required. The amount of powder required per well is 14 kg. At 1.5 g/mℓ, the volume of powder needed in each well is:

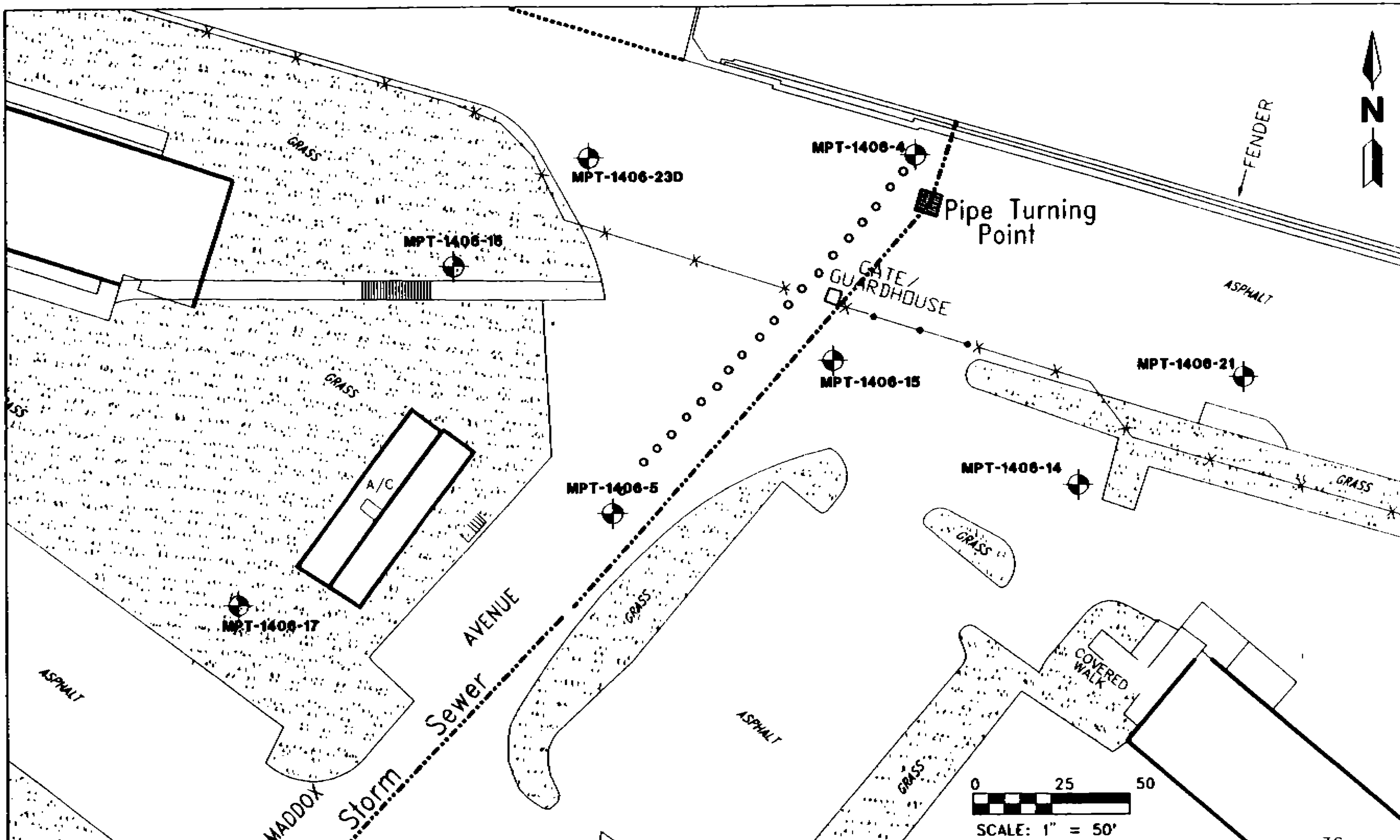
$$\frac{14 \ kg\ of\ MgO_2 \times 1000 \ \frac{g}{kg}}{1.5 \ \frac{g}{ml} \times 1000 \ \frac{ml}{l} \times 3.785 \ \frac{l}{gal} \times 7.48 \ \frac{gal}{ft^3}} = 0.3297 \ ft^3$$

Assuming a 5-foot column of water to be dosed, the required well diameter is:

$$Diameter = 2 \times r = 2 \times \sqrt{\frac{volume}{\pi \times 5 \ ft}} = 2 \times \sqrt{\frac{0.3297 \ ft^3}{\pi \times 5 \ ft}} = 0.29 \ ft = 3.48 \ inches$$

Therefore, 4-inch diameter wells will be required.

The proposed well locations are shown in the attached figure. Variations in final well locations may be necessary to avoid utilities and other subsurface features. Based on the above calculations, 26,985 grams of TRPH will be degraded at a maximum rate of 301 grams per day. This indicates a minimum required clean up time of approximately 90 days. As with the estimated clean up time in the source treatment system, this is considered optimistic and a safety factor of two should be applied. Therefore, the estimated time for clean up is approximately 180 days.



LEGEND

- Monitoring Well Location
- Dosing Well Location

DELTPIER/KGP/12/06/93

FIGURE B-6
DOSING WELL LOCATION MAP

REMEDIAL ACTION PLAN

ALPHA DELTA PIER
U.S. NAVAL STATION
MAYPORT, FLORIDA

APPENDIX C

BASIS OF DESIGN

BASIS OF DESIGN

The purpose of the RAP is to present a plan for remediation of petroleum contamination at the Alpha Delta Pier site which, when implemented, will result in a reduction of the level of petroleum related contamination in accordance with the requirements of Florida Administrative Code (FAC) Chapter 17-770.

Implementation of the remedial actions described in the RAP will include the following tasks:

- monitoring of existing wells for free product and manually recovering product as necessary;
- rehabilitation of the storm water pipes in the area of contamination by the installation of slip linings;
- application of oxygen and nutrients to the vadose zone soils and the aquifer to enhance natural biodegradation;
- start-up and testing of the system to optimize efficiency; and
- maintenance, operation, and monitoring of the system for up to 2 years.

Groundwater contamination exceeding regulatory standards has been identified at the Alpha Delta Piers at NS Mayport, Florida. Free product has been observed at the site in the past, but currently appears to be absent. Contaminated groundwater and possibly free product infiltrate a storm drainage pipe and discharge to the turning basin. The surficial aquifer in the vicinity of NS Mayport is classified, according to the criteria specified in FAC Chapter 17-3, as G-III.

Soil at the site typically consisted of very fine-grained sand, silt, shell material, and construction debris, such as concrete. Naturally occurring sediments consist of fine-grained sand and shell beds. Only the surficial, unconfined aquifer was encountered during drilling operations at the site. Groundwater beneath much of the site was encountered at approximately 4.0 feet bls. A literature search indicates that the base of the surficial aquifer is approximately 70 feet below land surface (bls). Water in the upper part of the unconfined surficial aquifer is relatively fresh. Generally, over much of the facility, groundwater at depths greater than 40 feet bls becomes brackish and is classified as G-III. At the site, groundwater becomes brackish at depths greater than 50 feet bls. The overall direction of groundwater flow is northerly toward the bulkheads and turning basin. At the bulkheads, groundwater flow is parallel to the piers and to the east. Hydraulic conductivity (K) values at the site ranged from 33.20 to 9.06 feet per day. The hydraulic gradient (I) was calculated to be 0.007 foot per foot. Based on the K of 21.13 feet per day and I of 0.007, the average linear pore water velocity (V) beneath the site was calculated to be 0.59 foot per day.

In general, contamination appears to be restricted to the pier areas. At the 1985 diesel fuel marine (DFM) pipeline break, contamination extends from the bulkhead to approximately 150 feet inland along Maddox Avenue. Laboratory analyses indicate the contamination may be from several sources, including the DFM pipeline and the oily waste collection system. Based on the available data, the FAC Chapter 17-770 used oil analytical group of contaminants are the basis for the remedial design. The presence of free product at the site has been variable.

Because the fresh water lens is not a viable potable water source and is not otherwise distinguishable from the brackish zone, the surficial aquifer is classified under FAC Chapter 17-3 as G-III. Action levels for remedial actions at this site are based on the upper limits of contaminant concentrations for monitoring only situations in a G-III aquifer.

A remedial strategy of containment and source abatement is proposed. The proposed containment action of rehabilitating the storm water pipe along Maddox Avenue will prevent future discharges of contaminated groundwater from the site into the turning basin. Source abatement actions will include monitoring/removal of any free product which may be present and the reduction of contaminant concentrations by in situ biodegradation. Biodegradation at the source area will be enhanced by the application of oxygen through a subsurface drip irrigation system delivering a hydrogen peroxide solution. Contaminated groundwater moving down gradient from the source area will be treated at the plume perimeter by a line of wells containing a magnesium peroxide powder oxygen source. A monitoring program is proposed which will allow for measurement of the progress of the remediation and provide feedback for maximizing the systems operating efficiency.

PRELIMINARY
COST ESTIMATE

for

Remedial Action

at

Alpha Delta Piers
Naval Station Mayport, Florida

December 1993

** BASIC INFORMATION **

00 1 1 14
01 PRELIMINARY
02
03 MAYPORT ALPHA DELTA PIER
04
05 MAYPORT, FLORIDA
06 N2
07 / /
08 BLAKE G. SVENDSEN
09 1000000.00
10 1.00
11 EA
12 01/21/92
13 02

** PRIME CONTRACTOR MARKUP **

14 A XXXXX 0.0 35.5 0.0 2 17 2 10 10 10 1.50 0.0 0.00 0.0 0.00 0.00 0.00

** SUBCONTRACTOR MARKUP **

15 A XXXXX 0.0 35.5 0.0 2 17 2 10 10 10 5 5 5 5 5 5 1.50 0.0 0.00 0.0 0.00 0.00 0.00

** END ITEMS **

WBS	ITEM	QTY	UM	R	SPEC	SSPEC	GRP	MATL	LABR	EQP	DESC
0805	AAAAAA	1.00	EA					0.00	0.00	0.00	DOMESTIC WATER EQUIPMENT
080501	AAAAAA	1.00	EA					0.00	0.00	0.00	PIPES AND FITTINGS
08050101	AAAAAA	1.00	EA					0.00	0.00	0.00	DOMESTIC WATER SUPPLY CO NNECTION
08050101	DJGLO	1.00	EA		02713	02715	PI	27.12	20.71	11.64	6 INCH TAPPING SADDLE TAP SIZE TO 2 I NCH
08050101	DJGLU	1.00	EA		02713	02715	PI	294.04	30.68	17.25	6X4 TAPPING SLEEVE
08050101	DJGMYJ	1.00	EA		02713	02715	PI	192.76	55.22	31.05	4 INCH TAPPING VALVE MJ
08050101	DJGMYO	1.00	EA		02713	02715	PI	0.00	46.01	69.38	TAP 4 INCH HOLE IN PIPE
08050101	SYSDC	1.00	EA					0.00	0.00	0.00	DOMESTIC WATER EQUIPMENT
2002	AAAAAA	1.00	LF					0.00	0.00	0.00	EXTERIOR ELECTRICAL DIST RIBUTION
200202	AAAAAA	1.00	EA					0.00	0.00	0.00	SWITCHES, CONTROLS, & DE VICES
20020201	AAAAAA	1.00	EA					0.00	0.00	0.00	ELECTRICAL DISTRIBUTION
20020201	C2	1.00	EA		01000	01000	MP	180.00	0.00	0.00	SINGLE PHASE 200 A POWER CONNECTION
20020201	SYSDC	0.00						0.00	0.00	0.00	ELECTRICAL DISTRIBUTION
3301	AAAAAA	1.00	LS					0.00	0.00	0.00	MOBILIZATION AND PREPARA TORY WORK
330101	AAAAAA	1.00	LS					0.00	0.00	0.00	MOBILIZATION OF CONSTRUC TION EQP AND PE RMITTING
33010107	AAAAAA	1.00	HR	2				0.00	0.00	0.00	CONSTRUCTION EQUIPMENT O WNERSHIP/OPERAT ION
33010107	C1	1.00	EA		01025	01025	MP	0.00	0.00	500.00	MOBOLIZATION OF SUBCONTR ACTOR

** END ITEMS **

WBS	ITEM	QTY	UM	R	SPEC	SSPEC	GRP	MATL	LABR	EQP	DESC
33010107	C2	20.00	DAY		01025	01025	MP	150.00	0.00	0.00	PER DIEM FOR SUBCONTRACT OR (3 MAN CREW)
33010107	SYSDC	0.00						0.00	0.00	0.00	CONSTRUCTION EQUIPMENT O PERATION
330102	AAAAAA	1.00	EA					0.00	0.00	0.00	MOBILIZATION OF PERSONNE L
33010201	AAAAAA	1.00	EA					0.00	0.00	0.00	CONSTRUCTION MONITORING
33010201	ABB1	280.00	HR		01000	01000	MP	0.00	30.00	5.00	CONSTRUCTION INSTALLATIO N SUPERVISION
33010201	SYSDC	0.00						0.00	0.00	0.00	SETUP OF SUPERVISORY STR UCTURE
330103	AAAAAA	1.00	LS					0.00	0.00	0.00	PRECONSTRUCTION SUBMITTA LS/IMPLEMENTATI ON PLANS
33010305	AAAAAA	1.00	EA	2				0.00	0.00	0.00	PERMITS
33010305	ABB1	1.00	EA		01000	01000	MP	0.00	0.00	850.00	CONSTRUCTION PERMITS
33010305	C2	1.00	EA		01000	01000	MP	1500.00	0.00	0.00	WASTE DISPOSAL AND HAULI NG PERMIT
33010305	SYSDC	0.00						0.00	0.00	0.00	PERMITS
33010327	AAAAAA	1.00	LS					0.00	0.00	0.00	CONSTRUCTION SCHEDULING (CPM)
33010327	ABB1	1.00	LS		01000	01000	MP	0.00	200.00	0.00	CONSTRUCTION SCHEDULING (CPM)
33010327	SYSDC	0.00						0.00	0.00	0.00	CONSTRUCTION SCHEDULING (CPM)
330104	AAAAAA	1.00	LS	2				0.00	0.00	0.00	SETUP/CONSTRUCT TEMPORAR Y FACILITIES
33010428	AAAAAA	1.00	EA					0.00	0.00	0.00	TEMPORARY STRUCTURES
33010428	C2	1.00	EA		01000	01000	MP	0.00	0.00	150.00	SIGNS
33010428	C2	1.00	EA		13900	13900	CN	0.00	0.00	17250.00	HAZARDOUS MATERIALS STOR AGE SHED W/ LIG HTS, VENT ILATION, & SUMP LINER
33010428	SYSDC	0.00						0.00	0.00	0.00	TEMPORARY STRUCTURES
3302	AAAAAA	1.00	LS					0.00	0.00	0.00	MONITORING, SAMPLING, TE STING, AND ANAL YSIS
330205	AAAAAA	1.00	EA					0.00	0.00	0.00	STARTUP SAMPLING
33020501	AAAAAA	1.00	EA					0.00	0.00	0.00	SURFACE WATER
33020501	ABB1	6.00	EA		13900	13900	SA	745.00	50.00	0.00	UP STREAM AND DOWN STREA M SAMPLES FROM STORM SEW ER
33020501	SYSDC	0.00						0.00	0.00	0.00	SURFACE WATER
33020502	AAAAAA	1.00	EA					0.00	0.00	0.00	GROUND WATER
33020502	ABB1	9.00	EA		13900	13900	SA	745.00	30.00	0.00	GROUND WATER SAMPLING AN D ANALYSIS

** END ITEMS **

WBS	ITEM	QTY	UM	R SPEC	SSPEC	GRP	MATL	LABR	EQP	DESC
33020502	ABB1A	7.00	EA	13900	13900	SA	150.00	30.00	0.00	MICROBIOLOGICAL SAMPLING AND ANALYSIS
33020502	SYSDC	0.00					0.00	0.00	0.00	GROUND WATER
330290	AAAAAA	1.00	YR				0.00	0.00	0.00	YEAR 1 O&M
33029001	AAAAAA	1.00	EA				0.00	0.00	0.00	YEAR 1 O&M
33029001	ABB1	15.00	EA	13900	13900	OM	50.00	240.00	0.00	SITE VISITS AND INSPECTI ONS
33029001	ABB2	68.00	EA	13900	13900	OM	745.00	30.00	0.00	CONTAMINATION MONITORING SAMPLING AND A NALYSIS
33029001	ABB2A	77.00	EA	13900	13900	SA	150.00	30.00	0.00	MICROBIOLOGY MONITORING SAMPLING AND AN ALYSIS
33029001	ABB2B	105.00	EA	13900	13900	SA	105.00	30.00	0.00	NUTRIENT MONITORING SAMP LING AND ANALYS IS
33029001	ABB2C	450.00	EA	13900	13900	SA	0.00	10.00	0.00	DOSING WELL MONITORING
33029001	ABB3	12.00	MO	13900	13900	OM	50.00	0.00	0.00	POWER COSTS
33029001	ABB4	365.00	DAY	13900	13900	OM	39.00	0.00	0.00	WATER COST @ $1.30 PER 1000 GALLONS
33029001	ABB6	12.00	EA	13900	13900	OM	10.00	240.00	0.00	MONTHLY REPORTS
33029001	SYSDC	0.00					0.00	0.00	0.00	YEAR 1 O&M
330291	AAAAAA	1.00	YR				0.00	0.00	0.00	SUBSEQUENT YEAR O&M
33029102	AAAAAA	1.00	YR				0.00	0.00	0.00	SUBSEQUENT YEAR O&M
33029102	ABB1	12.00	EA	13900	13900	OM	50.00	240.00	0.00	SITE VISITS AND INSPECTI ONS
33029102	ABB2	36.00	EA	13900	13900	OM	745.00	30.00	0.00	CONTAMINATION MONITORING SAMPLING AND A NALYSIS
33029102	ABB2A	28.00	EA	13900	13900	OM	150.00	30.00	0.00	MICROBIOLOGY MONITORING SAMPLING AND AN ALYSIS
33029102	ABB2B	84.00	EA	13900	13900	OM	105.00	30.00	0.00	NUTRIENT MONITORING SAMP LING AND ANALYS IS
33029102	ABB2C	360.00	EA	13900	13900	OM	0.00	10.00	0.00	DOSING WELL MONITORING
33029102	ABB3	12.00	MO	13900	13900	OM	50.00	0.00	0.00	POWER COSTS
33029102	ABB4	365.00	DAY	13900	13900	OM	39.00	0.00	0.00	WATER COST @ $1.30 PER 1000 GALLONS
33029102	ABB5	12.00	EA	13900	13900	OM	10.00	240.00	0.00	MONTHLY REPORTS
33029102	SYSDC	0.00					0.00	0.00	0.00	SUBSEQUENT YEAR O & M
03	AAAAAA	1.00	EA				0.00	0.00	0.00	SITE WORK
330303	AAAAAA	1.00	CY				0.00	0.00	0.00	EARTHWORK

** END ITEMS **

WBS	ITEM	QTY	UM	R SPEC	SSPEC	GRP	MATL	LABR	EQP	DESC
33030302	AAAAAA	1.00	LF				0.00	0.00	0.00	EXCAVATION/FILL
33030302	C1	1250.00	LF	13900	13900	CN	6.67	0.00	0.00	TRENCHING
33030302	C1	1250.00	LF	13900	13900	CN	0.00	0.00	3.41	INSTALL TUBING
33030302	C1	340.00	SF	13900	13900	CN	2.31	0.00	0.00	REMOVE PAVEMENT
33030302	C1	1360.00	LF	13900	13900	CN	2.05	0.00	0.00	CUT PAVEMENT
33030302	C2	340.00	SF	13900	13900	CN	5.78	0.00	0.00	PAVEMENT REPAIR
33030302	SYSDC	0.00					0.00	0.00	0.00	EXCAVATION AND FILL
3306	AAAAAA	1.00	EA				0.00	0.00	0.00	GROUNDWATER COLLECTION A ND CONTROL
330601	AAAAAA	1.00	EA				0.00	0.00	0.00	EXTRACTION AND INJECTION WELLS
33060102	AAAAAA	1.00	LF				0.00	0.00	0.00	OXYGEN DOSING WELLS
33060102	C1	1.00	EA	13900	13900	WD	0.00	0.00	1250.00	MOBILIZATION AND CREW PER DIEM
33060102	C3	30.00	EA	13900	13900	WD	40.00	0.00	0.00	WELL DEVELOPMENT
33060102	C3	30.00	EA	13900	13900	WD	410.00	0.00	0.00	4" PVC DOSING WELLS W/ 10' OF SCREE N AND FLU SH COVERS
33060102	SYSDC	0.00					0.00	0.00	0.00	OXYGEN DOSING WELLS
330602	AAAAAA	1.00	EA				0.00	0.00	0.00	STORM SEWER REHABILITATI ON
33060208	AAAAAA	1.00	SY				0.00	0.00	0.00	SYNTHETIC LINER
33060208	C1	250.00	LF	13900	13900	GW	63.00	10.00	0.00	SYNTHETIC PIPE LINER
33060208	C2	1.00	LS	13900	13900	CN	0.00	0.00	2500.00	EXCAVATION FOR LINER INS ERTION
33060208	C3	1.00	LS	13900	13900	CN	0.00	0.00	5000.00	PIPE CLEANING AND INSPEC TION
33060208	SYSDC	0.00					0.00	0.00	0.00	SYNTHETIC PIPE LINER
330607	AAAAAA	1.00	LSL				0.00	0.00	0.00	OXYGEN NUTRIENT DISTRIBU TION SYSTEM
33060702	AAAAAA	1.00	EA				0.00	0.00	0.00	CONTROL VALVES & METERS
33060702	C1	1.00	EA	13900	13900	PI	0.00	0.00	300.00	REDUCED PRESSURE BACKFLO W PREVENTER
33060702	C2	4.00	EA	13900	13900	PI	15.00	10.95	0.00	GATE VALVES
33060702	C3	3.00	EA	13900	13900	PI	0.00	0.00	32.90	FLOW METERS
33060702	C4	1.00	EA	13900	13900	PI	0.00	0.00	34.90	PREASURE GAUGE

** END ITEMS **

WBS	ITEM	QTY	UM	R SPEC	SSPEC	GRP	MATL	LABR	EQP	DESC
33060702	C5	2.00	EA	13900	13900	PI	0.00	0.00	10.00	SAMPLING PORTS
33060702	C6	2.00	EA	13900	13900	PI	0.00	0.00	198.00	WATER JET EDUCTORS
33060702	C7	1.00	EA	13900	13900	PI	0.00	0.00	250.00	SCREEN FILTER
33060702	SYSDC	0.00					0.00	0.00	0.00	VALVES
33060703	AAAAAA	1.00	LF				0.00	0.00	0.00	PIPING
33060703	C1	150.00	LF	13900	13900	PI	3.75	5.65	0.00	PVC PIPE SCH 80 1.5 INCH DIAMETER
33060703	C4	9.00	EA	13900	13900	PI	1.90	15.65	0.00	PVC 90 DEGREE SCH 80 ELB OW JOINT
33060703	C7	1.00	RL	13900	13900	PI	120.00	0.00	0.00	OXYGEN/NUTRIENT DISTRIBU TION TUBING 1 ROLL @ 6000 FEET
33060703	SYSDC	0.00					0.00	0.00	0.00	PIPING
33060705	AAAAAA	1.00	EA				0.00	0.00	0.00	HOLDING TANK
33060705	C1	2.00	EA	13900	13900	PI	0.00	0.00	65.00	55 GALLON DRUM PRODUCT C OLLECTION TANK ASSEMBLY
3060705	SYSDC	0.00					0.00	0.00	0.00	HOLDING TANK
3311	AAAAAA	1.00	EA				0.00	0.00	0.00	BIOLOGICAL TREATMENT
331104	AAAAAA	1.00	CY				0.00	0.00	0.00	IN-SITU BIODEGRADATION/N UTRIENT ADDITIO N
33110402	C1	2500.00	KG	13900	13900	TM	6.00	0.00	0.00	INSITU BIODEGRADATION WI TH MAGNESIUM PE ROXIDE PO WDER
33110402	C1	30.00	DR	13900	13900	TM	225.00	0.00	0.00	IN SITU BIODEGRADATION W/ HYDROGEN PER OXIDE SOLUTION
33110402	SYSDC	0.00					0.00	0.00	0.00	INSITU BIODEGRADATION WI TH DISOLVED HYD ROGEN PER OXIDE
3318	AAAAAA	1.00	LS				0.00	0.00	0.00	WASTE DISPOSAL
331802	AAAAAA	1.00	EA				0.00	0.00	0.00	WASTE CONTAINER HANDLING
33180201	AAAAAA	1.00	LS				0.00	0.00	0.00	HANDLING OF FILLED CONTA INERS
33180201	C1	2.00	EA	13900	13900	DI	0.00	0.00	65.00	DRUM REPLACEMENT COSTS
33180201	C2	2.00	EA	13900	13900	DI	0.00	10.00	0.00	DRUM LOADING
33180201	SYSDC	0.00					0.00	0.00	0.00	CONTAINER HANDLING
331803	AAAAAA	1.00	CY				0.00	0.00	0.00	TRANSPORTATION TO DISPOS AL FACILITY
3180301	AAAAAA	1.00	CY				0.00	0.00	0.00	LOADING/HAULING/UNLOADIN G OF WASTE MATE RIALS
33180301	C1	1.00	LS	13900	13900	DI	0.00	0.00	1.00	TRANSPORTATION OF WASTE DISPOSAL SITE

** END ITEMS **

WBS	ITEM	QTY	UM	R SPEC	SSPEC	GRP	MATL	LABR	EQP	DESC
33180301	SYSDC	0.00					0.00	0.00	0.00	HAULING WASTE
331809	AAAAAA	1.00	EA				0.00	0.00	0.00	DISPOSAL FEES AND TAXES
33180902	AAAAAA	1.00	TON				0.00	0.00	0.00	INCINERATOR
33180902	C1	75.00	TON	13900	13900	DI	55.00	0.00	0.00	RECOVERY WELL AND NUTRIE NT INJECTION WE LL IDW DI SPOSAL
33180902	C2	1.00	LS	13900	13900	DI	1.00	0.00	0.00	GROUNDWATER/FREE PRODUCT RECOVERY DISPO SAL
33180902	SYSDC	0.00					0.00	0.00	0.00	DISPOSAL FEES
GRP	AAAAAA	0.00				CN	0.00	0.00	0.00	CONSTRUCTION AND SITE WO RK
GRP	AAAAAA	0.00				DI	0.00	0.00	0.00	WASTE DISPOSAL
GRP	AAAAAA	0.00				GW	0.00	0.00	0.00	GROUNDWATER CONTROL
GRP	AAAAAA	0.00				MP	0.00	0.00	0.00	MOBILIZATION
GRP	AAAAAA	0.00				OM	0.00	0.00	0.00	OPERATION AND MAINTENANC E
GRP	AAAAAA	0.00				PI	0.00	0.00	0.00	FLOW CONTROL, MEASUREMEN T, AND PIPING
GRP	AAAAAA	0.00				SA	0.00	0.00	0.00	START UP SAMPLING AND ANALYSIS
GRP	AAAAAA	0.00				TM	0.00	0.00	0.00	TREATMENT MATERIALS
GRP	AAAAAA	0.00				WD	0.00	0.00	0.00	WELL DRILLING

SUMMARY REPORT
~~RK BREAKDOWN
~~LIMINARY

PRINTING DATE : 12/13/93 14
DATABASE USED : 01/21/92 02
PAGE NUMBER : 1
ESTIMATE NAME : MAYADPIR

ENGINEERING ESTIMATE

PROJECT: MAYPORT ALPHA DELTA PIER
LOCATION: MAYPORT, FLORIDA
ESTIMATORS: BLAKE G. SVENDSEN
PROJECT SIZE: 1.00 EA
AUTHORIZED CONSTRUCTION FUNDS: 1,000,000.00

CAT CODE:
UIC: N2
P-NO.:
DATE OF ESTIMATE: 12/13/93
BID DATE: / /

	COST/ WBS BASED ON 1.00	WBS UNITS	U/M	COST/WBS UNIT	TOTAL MU MATL COST	TOTAL MU LABOR COST	TOTAL MU EQUIP COST	TOTAL CONTRACT COST
PRIMARY FACILITIES								
0805 DOMESTIC WATER EQUIPMENT	1,002.79	1.00	EA	1,002.79	585	270	147	1,003
SUBTOTAL PRIMARY FACILITIES	1,002.79				585	270	147	1,003
ENVIRONMENTAL								
3301 MOBILIZATION AND PREPARA								
01 MOBILIZATION OF CONSTRUC		1.00	LS	3,986.50	3,417	0	570	3,987
02 MOBILIZATION OF PERSONNE		1.00	EA	16,462.60	0	14,868	1,595	16,463
03 PRECONSTRUCTION SUBMITTA		1.00	LS	3,030.65	1,709	354	968	3,031
04 SETUP/CONSTRUCT TEMPORAR		1.00	LS	19,818.60	0	0	19,819	19,819
3302 MONITORING, SAMPLING, TE								
05 STARTUP SAMPLING		1.00	EA	15,304.88	13,924	1,381	0	15,305
90 YEAR 1 O&M		1.00	YR	134,012.26	101,303	32,710	0	134,012
91 SUBSEQUENT YEAR O&M		1.00	YR	87,520.91	63,095	24,426	0	87,521
3303 SITE WORK								
03 EARTHWORK		1.00	CY	20,659.87	15,805	0	4,855	20,660
3306 GROUNDWATER COLLECTION A								
01 EXTRACTION AND INJECTION		1.00	EA	16,800.25	15,377	0	1,424	16,800
02 STORM SEWER REHABILITATI		1.00	EA	30,906.75	17,939	4,425	8,543	30,907
07 OXYGEN NUTRIENT DISTRIBU		1.00	LSL	4,092.60	865	1,827	1,401	4,093
3311 BIOLOGICAL TREATMENT								
04 IN-SITU BIODEGRADATION/N		1.00	CY	24,773.25	24,773	0	0	24,773
3318 WASTE DISPOSAL								
02 WASTE CONTAINER HANDLING		1.00	EA	183.47	0	35	148	183
03 TRANSPORTATION TO DISPOS		1.00	CY	1.14	0	0	1	1
09 DISPOSAL FEES AND TAXES		1.00	EA	4,699.51	4,700	0	0	4,700
SUBTOTAL ENVIRONMENTAL					262,906	80,026	39,322	382,253
TOTAL ESTIMATE CONTRACT					263,491	80,296	39,469	383,256
TOTAL ESTIMATE CONTRACT (ROUNDED)								383,000

ENGINEERING ESTIMATE

PROJECT: MAYPORT ALPHA DELTA PIER
LOCATION: MAYPORT, FLORIDA
ESTIMATORS: BLAKE G. SVENDSEN
PROJECT SIZE: 1.00 EA
AUTHORIZED CONSTRUCTION FUNDS: 1,000,000.00

CAT CODE:
UIC: N2
P-NO.:
DATE OF ESTIMATE: 12/13/93
BID DATE: / /

PRIME MARK-UP

SPECIFICATION SECTIONS MARKED UP FOR PRIME

XXXXX

DESIGN CONTINGENCIES	0.00%		
TAX ON MATERIAL	0.0%		
TAX & INSURANCE ON LABOR	35.5%		
TAX ON EQUIPMENT	0.0%		
PRIME OVERHEAD	MAT'L	LABOR	EQUIP
	2%	17%	2%
PRIME PROFIT	MAT'L	LABOR	EQUIP
	10%	10%	10%
BOND	1.50%		
MISC. TAXES	0.0%		
CQC	0.00%		
ESCALATION	0.0%		
PCAS	0.00%		
CONT	0.00%		
SIOH	0.00%		
MATERIAL COMPOSITE MARK-UP	1.139		
LABOR COMPOSITE MARK-UP	1.770		
EQUIPMENT COMPOSITE MARK-UP	1.139		

SUB MARK-UP A

SPECIFICATION SECTIONS MARKED UP FOR SUB

XXXXX

DESIGN CONTINGENCIES	0.00%		
TAX ON MATERIAL	0.0%		
TAX & INSURANCE ON LABOR	35.5%		
TAX ON EQUIPMENT	0.0%		
SUB OVERHEAD	MAT'L	LABOR	EQUIP
	2%	17%	2%
SUB PROFIT	MAT'L	LABOR	EQUIP
	10%	10%	10%
PRIME OVERHEAD	MAT'L	LABOR	EQUIP
	5%	5%	5%
PRIME PROFIT	MAT'L	LABOR	EQUIP
	5%	5%	5%
BOND	1.50%		
MISC. TAXES	0.0%		
CQC	0.00%		
ESCALATION	0.0%		
PCAS	0.00%		
CONT	0.00%		
SIOH	0.00%		
MATERIAL COMPOSITE MARK-UP	1.256		
LABOR COMPOSITE MARK-UP	1.951		
EQUIPMENT COMPOSITE MARK-UP	1.256		

INPUT REPORT
MODIFIER
PRELIMINARY

PRINTING DATE : 12/13/93 14
DATABASE USED : 01/21/92 02
PAGE NUMBER : 1
ESTIMATE NAME : MAYADPIR

ENGINEERING ESTIMATE

PROJECT: MAYPORT ALPHA DELTA PIER
LOCATION: MAYPORT, FLORIDA
ESTIMATORS: BLAKE G. SVENDSEN
PROJECT SIZE: 1.00 EA
AUTHORIZED CONSTRUCTION FUNDS: 1,000,000.00

CAT CODE:
UIC: N2
P-NO.:
DATE OF ESTIMATE: 12/13/93
BID DATE: / /

SPEC	ACT	WBS	MATL	LABOR	EQUIP

BACKUP REPORT
WORK BREAKDOWN-SPEC
PRELIMINARY

PRINTING DATE : 12/13/93 14
DATABASE USED : 01/21/92 02
PAGE NUMBER : 1
ESTIMATE NAME : MAYADPIR

ENGINEERING ESTIMATE

PROJECT: MAYPORT ALPHA DELTA PIER
LOCATION: MAYPORT, FLORIDA
ESTIMATORS: BLAKE G. SVENDSEN
PROJECT SIZE: 1.00 EA
AUTHORIZED CONSTRUCTION FUNDS: 1,000,000.00

CAT CODE:
UIC: N2
P-NO.:
DATE OF ESTIMATE: 12/13/93
BID DATE: / /

	GRP QUAN	U/M	MUP/ EXT	LUP/ EXT	EUP/ EXT	TOTAL
08050101 PLUMBING						
PLUMBING EQUIPMENT						
DOMESTIC WATER EQUIPMENT						
DOMESTIC WATER SUPPLY CONNECTION						
SYSDC DOMESTIC WATER EQUIPMENT						
02713 EXTERIOR WATER DISTRIBUTION SYSTEM						
02715 EXTERIOR CONDENSATE RETURN SYSTEM						
DJGLO 6 INCH TAPPING SADDLE			30.89*	36.66	13.26	80.80
TAP SIZE TO 2 INCH	1.00	EA	31	37	13	81
DJGLU			334.91*	54.30	19.65	408.86
6X4 TAPPING SLEEVE	1.00	EA	335	54	20	409
DJGMYJ			219.55*	97.74	35.37	352.66
4 INCH TAPPING VALVE MJ	1.00	EA	220	98	35	353
DJGMYO			0.00*	81.44	79.02	160.46
TAP 4 INCH HOLE IN PIPE	1.00	EA	0	81	79	160
SUBTOTAL-SUBSPEC SECTION 02715			585	270	147	1,003
TOTAL FOR SPEC SECTION 02713			585	270	147	1,003
SUBTOTAL-WORK BREAKDOWN 08050101			585	270	147	1,003
TOTAL FOR WORK BREAKDOWN 08050101			585	270	147	1,003
COST/WBS UNIT 08050101						1,002.79

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	GRP QUAN	U/M	MUP/ EXT	LUP/ EXT	EUP/ EXT	TOTAL
20020201 SITE ELECTRICAL UTILITIES						
EXTERIOR ELECTRICAL DISTRIBUTION						
SWITCHES, CONTROLS, & DEVICES						
ELECTRICAL DISTRIBUTION						
SYSDC ELECTRICAL DISTRIBUTION						
01000 GENERAL REQUIREMENTS						
01000 GENERAL REQUIREMENTS						
C2 SINGLE PHASE 200 A POWER			205.02*	0.00*	0.00*	205.02
CONNECTION	1.00	EA	205	0	0	205

	GRP QUAN	U/M	MUP/ EXT	LUP/ EXT	EUP/ EXT	TOTAL
SUBTOTAL-SUBSPEC SECTION 01000			205	0	0	205
TOTAL FOR SPEC SECTION 01000			205	0	0	205
SUBTOTAL-WORK BREAKDOWN 20020201			205	0	0	205
TOTAL FOR WORK BREAKDOWN 20020201			205	0	0	205
COST/WBS UNIT 20020201						205.02

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33010107 HTRW REMEDIAL ACTION
MOBILIZATION AND PREPARATORY WORK
MOBILIZATION OF CONSTRUCTION EQP AND FACILITIES
CONSTRUCTION EQUIPMENT O WNERSHIP/OPERATION

SYSDC CONSTRUCTION EQUIPMENT OPERATION

01025 SHIPPING

01025 SHIPPING

		GRP QUAN	U/M	MUP/ EXT	LUP/ EXT	EUP/ EXT	TOTAL
C1	MOBOLIZATION OF SUBCONTR			0.00*	0.00*	569.50*	569.50
	ACTOR	1.00	EA	0	0	570	570
C2	PER DIEM FOR SUBCONTRACT			170.85*	0.00*	0.00*	170.85
	OR (3 MAN CREW)	20.00	DAY	3,417	0	0	3,417
	SUBTOTAL-SUBSPEC SECTION 01025			3,417	0	570	3,987
	TOTAL FOR SPEC SECTION 01025			3,417	0	570	3,987
	SUBTOTAL-WORK BREAKDOWN 33010107			3,417	0	570	3,987
	TOTAL FOR WORK BREAKDOWN 33010107			3,417	0	570	3,987
	COST/WBS UNIT 33010107						3,986.50

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33010201 HTRW REMEDIAL ACTION
MOBILIZATION AND PREPARATORY WORK
MOBILIZATION OF PERSONNEL
CONSTRUCTION MONITORING

SYSDC SETUP OF SUPERVISORY STRUCTURE

01000 GENERAL REQUIREMENTS

01000 GENERAL REQUIREMENTS

		GRP QUAN	U/M	MUP/ EXT	LUP/ EXT	EUP/ EXT	TOTAL
ABB1	CONSTRUCTION INSTALLATIO			0.00*	53.10*	5.70*	58.80
	N SUPERVISION	280.00	HR	0	14,868	1,595	16,463
	SUBTOTAL-SUBSPEC SECTION 01000			0	14,868	1,595	16,463
	TOTAL FOR SPEC SECTION 01000			0	14,868	1,595	16,463
	SUBTOTAL-WORK BREAKDOWN 33010201			0	14,868	1,595	16,463

	GRP QUAN	U/M	MUP/ EXT	LUP/ EXT	EUP/ EXT	TOTAL
TOTAL FOR WORK BREAKDOWN 33010201			0	14,868	1,595	16,463
COST/WBS UNIT 33010201						16,462.60

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33010305 HTRW REMEDIAL ACTION
MOBILIZATION AND PREPARATORY WORK
PRECONSTRUCTION SUBMITTALS/IMPLEMENTATION PLANS
PERMITS

SYSDC PERMITS

01000 GENERAL REQUIREMENTS

01000 GENERAL REQUIREMENTS

	GRP QUAN	U/M	MUP/ EXT	LUP/ EXT	EUP/ EXT	TOTAL
ABB1			0.00*	0.00*	968.15*	968.15
CONSTRUCTION PERMITS	1.00	EA	0	0	968	968
C2 WASTE DISPOSAL AND HAULI			1,708.50*	0.00*	0.00*	1,708.50
NG PERMIT	1.00	EA	1,709	0	0	1,709
SUBTOTAL-SUBSPEC SECTION 01000			1,709	0	968	2,677
TOTAL FOR SPEC SECTION 01000			1,709	0	968	2,677
SUBTOTAL-WORK BREAKDOWN 33010305			1,709	0	968	2,677
TOTAL FOR WORK BREAKDOWN 33010305			1,709	0	968	2,677
COST/WBS UNIT 33010305						2,676.65

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33010327 HTRW REMEDIAL ACTION
MOBILIZATION AND PREPARATORY WORK
PRECONSTRUCTION SUBMITTALS/IMPLEMENTATION PLANS
CONSTRUCTION SCHEDULING (CPM)

SYSDC CONSTRUCTION SCHEDULING (CPM)

01000 GENERAL REQUIREMENTS

01000 GENERAL REQUIREMENTS

	GRP QUAN	U/M	MUP/ EXT	LUP/ EXT	EUP/ EXT	TOTAL
ABB1 CONSTRUCTION SCHEDULING			0.00*	354.00*	0.00*	354.00
(CPM)	1.00	LS	0	354	0	354
SUBTOTAL-SUBSPEC SECTION 01000			0	354	0	354
TOTAL FOR SPEC SECTION 01000			0	354	0	354
SUBTOTAL-WORK BREAKDOWN 33010327			0	354	0	354
TOTAL FOR WORK BREAKDOWN 33010327			0	354	0	354
COST/WBS UNIT 33010327						354.00

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	GRP QUAN	U/M	MUP/ EXT	LUP/ EXT	EUP/ EXT	TOTAL
33010428 HTRW REMEDIAL ACTION						
MOBILIZATION AND PREPARATORY WORK						
SETUP/CONSTRUCT TEMPORARY FACILITIES						
TEMPORARY STRUCTURES						
SYSDC TEMPORARY STRUCTURES						
01000 GENERAL REQUIREMENTS						
01000 GENERAL REQUIREMENTS						
C2			0.00*	0.00*	170.85*	170.85
SIGNS	1.00	EA	0	0	171	171
SUBTOTAL-SUBSPEC SECTION 01000			0	0	171	171
TOTAL FOR SPEC SECTION 01000			0	0	171	171
13900 MISCELLANEOUS SPECIAL CONSTRUCTION						
13900 MISCELLANEOUS SPECIAL CONSTRUCTION						
C2 HAZARDOUS MATERIALS STOR						
AGE SHED W/ LIGHTS, VENT		CN	0.00*	0.00*	19,647.75*	19,647.75
ILATION, & SUMP LINER	1.00	EA	0	0	19,648	19,648
SUBTOTAL-SUBSPEC SECTION 13900			0	0	19,648	19,648
TOTAL FOR SPEC SECTION 13900			0	0	19,648	19,648
SUBTOTAL-WORK BREAKDOWN 33010428			0	0	19,819	19,819
TOTAL FOR WORK BREAKDOWN 33010428			0	0	19,819	19,819
COST/WBS UNIT 33010428						19,818.60

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	GRP QUAN	U/M	MUP/ EXT	LUP/ EXT	EUP/ EXT	TOTAL
33020501 HTRW REMEDIAL ACTION						
MONITORING, SAMPLING, TESTING, AND ANALYSIS						
SAMPLING SURFACE WATER/GROUND WATER/LIQUID WASTE						
SURFACE WATER						
SYSDC SURFACE WATER						
13900 MISCELLANEOUS SPECIAL CONSTRUCTION						
13900 MISCELLANEOUS SPECIAL CONSTRUCTION						
ABB1 UP STREAM AND DOWN STREA						
M SAMPLES FROM STORM SEW		SA	848.56*	88.50*	0.00*	937.06
ER	6.00	EA	5,091	531	0	5,622
SUBTOTAL-SUBSPEC SECTION 13900			5,091	531	0	5,622
TOTAL FOR SPEC SECTION 13900			5,091	531	0	5,622
SUBTOTAL-WORK BREAKDOWN 33020501			5,091	531	0	5,622

		GRP QUAN	U/M	MUP/ EXT	LUP/ EXT	EUP/ EXT	TOTAL
TOTAL FOR WORK BREAKDOWN	33020501			5,091	531	0	5,622
COST/WBS UNIT	33020501						5,622.33

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33020502 HTRW REMEDIAL ACTION
MONITORING, SAMPLING, TESTING, AND ANALYSIS
SAMPLING SURFACE WATER/GROUND WATER/LIQUID WASTE
GROUND WATER

SYSDC GROUND WATER

13900 MISCELLANEOUS SPECIAL CONSTRUCTION

13900 MISCELLANEOUS SPECIAL CONSTRUCTION

		GRP QUAN	U/M	MUP/ EXT	LUP/ EXT	EUP/ EXT	TOTAL
ABB1	GROUND WATER SAMPLING AN			848.56*	53.10*	0.00*	901.66
	D ANALYSIS	9.00	EA	7,637	478	0	8,115
ABB1A	MICROBIOLOGICAL SAMPLING			170.85*	53.10*	0.00*	223.95
	AND ANALYSIS	7.00	EA	1,196	372	0	1,568
	SUBTOTAL-SUBSPEC SECTION 13900			8,833	850	0	9,683
	TOTAL FOR SPEC SECTION 13900			8,833	850	0	9,683
	SUBTOTAL-WORK BREAKDOWN 33020502			8,833	850	0	9,683
	TOTAL FOR WORK BREAKDOWN 33020502			8,833	850	0	9,683
	COST/WBS UNIT 33020502						9,682.55

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33029001 HTRW REMEDIAL ACTION
MONITORING, SAMPLING, TESTING, AND ANALYSIS

SYSDC YEAR 1 O&M

13900 MISCELLANEOUS SPECIAL CONSTRUCTION

13900 MISCELLANEOUS SPECIAL CONSTRUCTION

		GRP QUAN	U/M	MUP/ EXT	LUP/ EXT	EUP/ EXT	TOTAL
ABB1	SITE VISITS AND INSPECTI			56.95*	424.80*	0.00*	481.75
	ONS	15.00	EA	854	6,372	0	7,226
ABB2	CONTAMINATION MONITORING			848.56*	53.10*	0.00*	901.66
	SAMPLING AND ANALYSIS	68.00	EA	57,702	3,611	0	61,313
ABB2A	MICROBIOLOGY MONITORING			170.85*	53.10*	0.00*	223.95
	SAMPLING AND ANALYSIS	77.00	EA	13,155	4,089	0	17,244
ABB2B	NUTRIENT MONITORING SAMP			119.60*	53.10*	0.00*	172.70
	LING AND ANALYSIS	105.00	EA	12,557	5,576	0	18,133
ABB2C				0.00*	17.70*	0.00*	17.70
	DOSING WELL MONITORING	450.00	EA	0	7,965	0	7,965
ABB3				56.95*	0.00*	0.00*	56.95
	POWER COSTS	12.00	MO	683	0	0	683

BACKUP REPORT
RK BREAKDOWN-SPEC

PRINTING DATE: 12/13/93 14
DATABASE DATE: 01/21/92 02

		GRP QUAN	U/M	MUP/ EXT	LUP/ EXT	EUP/ EXT	TOTAL
33029001	HTRW REMEDIAL ACTION						
	MONITORING, SAMPLING, TESTING, AND ANALYSIS						
ABB4	WATER COST @ $1.30 PER			44.42*	0.00*	0.00*	44.42
	1000 GALLONS	365.00	DAY	16,214	0	0	16,214
ABB6				11.39*	424.80*	0.00*	436.19
	MONTHLY REPORTS	12.00	EA	137	5,098	0	5,234
	SUBTOTAL-SUBSPEC SECTION 13900			101,303	32,710	0	134,012
	TOTAL FOR SPEC SECTION 13900			101,303	32,710	0	134,012
	SUBTOTAL-WORK BREAKDOWN 33029001			101,303	32,710	0	134,012
	TOTAL FOR WORK BREAKDOWN 33029001			101,303	32,710	0	134,012
	COST/WBS UNIT 33029001						134,012.26

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		GRP QUAN	U/M	MUP/ EXT	LUP/ EXT	EUP/ EXT	TOTAL
33029102	HTRW REMEDIAL ACTION						
	MONITORING, SAMPLING, TESTING, AND ANALYSIS						
SYSDC	SUBSEQUENT YEAR O & M						
13900 MISCELLANEOUS SPECIAL CONSTRUCTION							
13900 MISCELLANEOUS SPECIAL CONSTRUCTION							
ABB1	SITE VISITS AND INSPECTI			56.95*	424.80*	0.00*	481.75
	ONS	12.00	EA	683	5,098	0	5,781
ABB2	CONTAMINATION MONITORING			848.56*	53.10*	0.00*	901.66
	SAMPLING AND ANALYSIS	36.00	EA	30,548	1,912	0	32,460
ABB2A	MICROBIOLOGY MONITORING			170.85*	53.10*	0.00*	223.95
	SAMPLING AND ANALYSIS	28.00	EA	4,784	1,487	0	6,271
ABB2B	NUTRIENT MONITORING SAMP			119.60*	53.10*	0.00*	172.70
	LING AND ANALYSIS	84.00	EA	10,046	4,460	0	14,506
ABB2C				0.00*	17.70*	0.00*	17.70
	DOSING WELL MONITORING	360.00	EA	0	6,372	0	6,372
ABB3				56.95*	0.00*	0.00*	56.95
	POWER COSTS	12.00	MO	683	0	0	683
ABB4	WATER COST @ $1.30 PER			44.42*	0.00*	0.00*	44.42
	1000 GALLONS	365.00	DAY	16,214	0	0	16,214
ABB5				11.39*	424.80*	0.00*	436.19
	MONTHLY REPORTS	12.00	EA	137	5,098	0	5,234
	SUBTOTAL-SUBSPEC SECTION 13900			63,095	24,426	0	87,521
	TOTAL FOR SPEC SECTION 13900			63,095	24,426	0	87,521
	SUBTOTAL-WORK BREAKDOWN 33029102			63,095	24,426	0	87,521
	TOTAL FOR WORK BREAKDOWN 33029102			63,095	24,426	0	87,521
	COST/WBS UNIT 33029102						87,520.91

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	GRP QUAN	U/M	MUP/ EXT	LUP/ EXT	EUP/ EXT	TOTAL
33030302 HTRW REMEDIAL ACTION						
SITE WORK						
EARTHWORK						
EXCAVATION/FILL						
SYSDC EXCAVATION AND FILL						
13900 MISCELLANEOUS SPECIAL CONSTRUCTION						
13900 MISCELLANEOUS SPECIAL CONSTRUCTION						
C1			7.60*	0.00*	0.00*	7.60
TRENCHING	1,250.00	LF	9,496	0	0	9,496
C1			0.00*	0.00*	3.88*	3.88
INSTALL TUBING	1,250.00	LF	0	0	4,855	4,855
C1			2.63*	0.00*	0.00*	2.63
REMOVE PAVEMENT	340.00	SF	895	0	0	895
C1			2.33*	0.00*	0.00*	2.33
CUT PAVEMENT	1,360.00	LF	3,176	0	0	3,176
C2			6.58*	0.00*	0.00*	6.58
PAVEMENT REPAIR	340.00	SF	2,238	0	0	2,238
SUBTOTAL-SUBSPEC SECTION 13900			15,805	0	4,855	20,660
TOTAL FOR SPEC SECTION 13900			15,805	0	4,855	20,660
SUBTOTAL-WORK BREAKDOWN 33030302			15,805	0	4,855	20,660
TOTAL FOR WORK BREAKDOWN 33030302			15,805	0	4,855	20,660
COST/WBS UNIT 33030302						20,659.87

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	GRP QUAN	U/M	MUP/ EXT	LUP/ EXT	EUP/ EXT	TOTAL
33060102 HTRW REMEDIAL ACTION						
GROUNDWATER COLLECTION AND CONTROL						
EXTRACTION AND INJECTION WELLS						
OXYGEN DOSING WELLS						
SYSDC OXYGEN DOSING WELLS						
13900 MISCELLANEOUS SPECIAL CONSTRUCTION						
13900 MISCELLANEOUS SPECIAL CONSTRUCTION						
C1 MOBILIZATION AND CREW			0.00*	0.00*	1,423.75*	1,423.75
PER DIEM	1.00	EA	0	0	1,424	1,424
C3			45.56*	0.00*	0.00*	45.56
WELL DEVELOPMENT	30.00	EA	1,367	0	0	1,367
C3 4" PVC DOSING WELLS						
W/ 10' OF SCREEN AND FLU		WD	466.99*	0.00*	0.00*	466.99
SH COVERS	30.00	EA	14,010	0	0	14,010

	GRP QUAN	U/M	MUP/ EXT	LUP/ EXT	EUP/ EXT	TOTAL
SUBTOTAL-SUBSPEC SECTION 13900			15,377	0	1,424	16,800
TOTAL FOR SPEC SECTION 13900			15,377	0	1,424	16,800
SUBTOTAL-WORK BREAKDOWN 33060102			15,377	0	1,424	16,800
TOTAL FOR WORK BREAKDOWN 33060102			15,377	0	1,424	16,800
COST/WBS UNIT 33060102						16,800.25

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33060208 HTRW REMEDIAL ACTION
GROUNDWATER COLLECTION AND CONTROL
SUBSURFACE DRAINAGE/COLLECTION
SYNTHETIC LINER

SYSDC SYNTHETIC PIPE LINER

13900 MISCELLANEOUS SPECIAL CONSTRUCTION

13900 MISCELLANEOUS SPECIAL CONSTRUCTION

		GRP QUAN	U/M	MUP/ EXT	LUP/ EXT	EUP/ EXT	TOTAL
C1				71.76*	17.70*	0.00*	89.46
	SYNTHETIC PIPE LINER	250.00	LF	17,939	4,425	0	22,364
C2	EXCAVATION FOR LINER INS			0.00*	0.00*	2,847.50*	2,847.50
	ERTION	1.00	LS	0	0	2,848	2,848
C3	PIPE CLEANING AND INSPEC			0.00*	0.00*	5,695.00*	5,695.00
	TION	1.00	LS	0	0	5,695	5,695
	SUBTOTAL-SUBSPEC SECTION 13900			17,939	4,425	8,543	30,907
	TOTAL FOR SPEC SECTION 13900			17,939	4,425	8,543	30,907
	SUBTOTAL-WORK BREAKDOWN 33060208			17,939	4,425	8,543	30,907
	TOTAL FOR WORK BREAKDOWN 33060208			17,939	4,425	8,543	30,907
	COST/WBS UNIT 33060208						30,906.75

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33060702 HTRW REMEDIAL ACTION
GROUNDWATER COLLECTION AND CONTROL
PUMPING/COLLECTION
CONTROL VALVES & METERS

SYSDC VALVES

13900 MISCELLANEOUS SPECIAL CONSTRUCTION

13900 MISCELLANEOUS SPECIAL CONSTRUCTION

		GRP QUAN	U/M	MUP/ EXT	LUP/ EXT	EUP/ EXT	TOTAL
C1	REDUCED PRESSURE BACKFLO			0.00*	0.00*	341.70*	341.70
	W PREVENTER	1.00	EA	0	0	342	342

		GRP QUAN	U/M	MUP/ EXT	LUP/ EXT	EUP/ EXT	TOTAL
33060702	HTRW REMEDIAL ACTION						
	GROUNDWATER COLLECTION AND CONTROL						
	PUMPING/COLLECTION						
	CONTROL VALVES & METERS						
C2				17.09*	19.38*	0.00*	36.47
	GATE VALVES	4.00	EA	68	78	0	146
C3				0.00*	0.00*	37.47*	37.47
	FLOW METERS	3.00	EA	0	0	112	112
C4				0.00*	0.00*	39.75*	39.75
	PREASURE GAUGE	1.00	EA	0	0	40	40
C5				0.00*	0.00*	11.39*	11.39
	SAMPLING PORTS	2.00	EA	0	0	23	23
C6				0.00*	0.00*	225.52*	225.52
	WATER JET EDUCTORS	2.00	EA	0	0	451	451
C7				0.00*	0.00*	284.75*	284.75
	SCREEN FILTER	1.00	EA	0	0	285	285
	SUBTOTAL-SUBSPEC SECTION 13900			68	78	1,252	1,398
	TOTAL FOR SPEC SECTION 13900			68	78	1,252	1,398
	SUBTOTAL-WORK BREAKDOWN 33060702			68	78	1,252	1,398
	TOTAL FOR WORK BREAKDOWN 33060702			68	78	1,252	1,398
	COST/WBS UNIT 33060702						1,398.31

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		GRP QUAN	U/M	MUP/ EXT	LUP/ EXT	EUP/ EXT	TOTAL
33060703	HTRW REMEDIAL ACTION						
	GROUNDWATER COLLECTION AND CONTROL						
	PUMPING/COLLECTION						
	PIPING						
SYSDC	PIPING						
13900 MISCELLANEOUS SPECIAL CONSTRUCTION							
13900 MISCELLANEOUS SPECIAL CONSTRUCTION							
C1	PVC PIPE SCH 80 1.5 INCH			4.27*	10.00*	0.00*	14.27
	DIAMETER	150.00	LF	641	1,500	0	2,141
C4	PVC 90 DEGREE SCH 80 ELB			2.16*	27.70*	0.00*	29.86
	OW JOINT	9.00	EA	19	249	0	269
C7	OXYGEN/NUTRIENT DISTRIBU						
	TION TUBING	PI		136.68*	0.00*	0.00*	136.68
	1 ROLL @ 6000 FEET	1.00	RL	137	0	0	137
	SUBTOTAL-SUBSPEC SECTION 13900			797	1,749	0	2,546
	TOTAL FOR SPEC SECTION 13900			797	1,749	0	2,546
	SUBTOTAL-WORK BREAKDOWN 33060703			797	1,749	0	2,546

	GRP QUAN	U/M	MUP/ EXT	LUP/ EXT	EUP/ EXT	TOTAL
TOTAL FOR WORK BREAKDOWN 33060703			797	1,749	0	2,546
COST/WBS UNIT 33060703						2,546.22

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33060705 HTRW REMEDIAL ACTION
GROUNDWATER COLLECTION AND CONTROL
PUMPING/COLLECTION
HOLDING TANK

SYSDC HOLDING TANK

13900 MISCELLANEOUS SPECIAL CONSTRUCTION

	GRP QUAN	U/M	MUP/ EXT	LUP/ EXT	EUP/ EXT	TOTAL
13900 MISCELLANEOUS SPECIAL CONSTRUCTION						
C1 55 GALLON DRUM PRODUCT C			0.00*	0.00*	74.04*	74.04
OLLECTION TANK ASSEMBLY	2.00	EA	0	0	148	148
SUBTOTAL-SUBSPEC SECTION 13900			0	0	148	148
TOTAL FOR SPEC SECTION 13900			0	0	148	148
SUBTOTAL-WORK BREAKDOWN 33060705			0	0	148	148
TOTAL FOR WORK BREAKDOWN 33060705			0	0	148	148
COST/WBS UNIT 33060705						148.07

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33110402 HTRW REMEDIAL ACTION
BIOLOGICAL TREATMENT
IN-SITU BIODEGRADATION/BIORECLAMATION
INSITU BIODEGRADATION WI TH DISOLVED HYDROGEN PER OXIDE

SYSDC INSITU BIODEGRADATION WITH DISOLVED HYDROGEN PEROXIDE

13900 MISCELLANEOUS SPECIAL CONSTRUCTION

	GRP QUAN	U/M	MUP/ EXT	LUP/ EXT	EUP/ EXT	TOTAL
13900 MISCELLANEOUS SPECIAL CONSTRUCTION						
C1 INSITU BIODEGRADATION WI						
TH MAGNESIUM PEROXIDE PO		TM	6.83*	0.00*	0.00*	6.83
WDER	2,500.00	KG	17,085	0	0	17,085
C1 IN SITU BIODEGRADATION						
W/ HYDROGEN PEROXIDE		TM	256.28*	0.00*	0.00*	256.28
SOLUTION	30.00	DR	7,688	0	0	7,688
SUBTOTAL-SUBSPEC SECTION 13900			24,773	0	0	24,773
TOTAL FOR SPEC SECTION 13900			24,773	0	0	24,773
SUBTOTAL-WORK BREAKDOWN 33110402			24,773	0	0	24,773

	GRP QUAN	U/M	MUP/ EXT	LUP/ EXT	EUP/ EXT	TOTAL
TOTAL FOR WORK BREAKDOWN 33110402			24,773	0	0	24,773
COST/WBS UNIT 33110402						24,773.25

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33180201 HTRW REMEDIAL ACTION
DISPOSAL (OTHER THAN COMMERCIAL)
CONTAINER HANDLING
HANDLING OF FILLED CONTA INERS

SYSDC CONTAINER HANDLING

13900 MISCELLANEOUS SPECIAL CONSTRUCTION

13900 MISCELLANEOUS SPECIAL CONSTRUCTION

	GRP QUAN	U/M	MUP/ EXT	LUP/ EXT	EUP/ EXT	TOTAL
C1			0.00*	0.00*	74.04*	74.04
DRUM REPLACEMENT COSTS	2.00	EA	0	0	148	148
C2			0.00*	17.70*	0.00*	17.70
DRUM LOADING	2.00	EA	0	35	0	35
SUBTOTAL-SUBSPEC SECTION 13900			0	35	148	183
TOTAL FOR SPEC SECTION 13900			0	35	148	183
SUBTOTAL-WORK BREAKDOWN 33180201			0	35	148	183
TOTAL FOR WORK BREAKDOWN 33180201			0	35	148	183
COST/WBS UNIT 33180201						183.47

++

33180301 HTRW REMEDIAL ACTION
DISPOSAL (OTHER THAN COMMERCIAL)
TRANSPORTATION TO STORAGE/DISPOSAL FACILITY
LOADING/HAULING/UNLOADIN G OF WASTE MATERIALS

SYSDC HAULING WASTE

13900 MISCELLANEOUS SPECIAL CONSTRUCTION

13900 MISCELLANEOUS SPECIAL CONSTRUCTION

	GRP QUAN	U/M	MUP/ EXT	LUP/ EXT	EUP/ EXT	TOTAL
C1 TRANSPORTATION OF WASTE			0.00*	0.00*	1.14*	1.14
DISPOSAL SITE	1.00	LS	0	0	1	1
SUBTOTAL-SUBSPEC SECTION 13900			0	0	1	1
TOTAL FOR SPEC SECTION 13900			0	0	1	1
SUBTOTAL-WORK BREAKDOWN 33180301			0	0	1	1
TOTAL FOR WORK BREAKDOWN 33180301			0	0	1	1
COST/WBS UNIT 33180301						1.14

++

		GRP QUAN	U/M	MUP/ EXT	LUP/ EXT	EUP/ EXT	TOTAL
33180902	HTRW REMEDIAL ACTION						
	DISPOSAL (OTHER THAN COMMERCIAL)						
	DISPOSAL FEES AND TAXES						
	INCINERATOR						
SYSDC	DISPOSAL FEES						
13900	MISCELLANEOUS SPECIAL CONSTRUCTION						
13900	MISCELLANEOUS SPECIAL CONSTRUCTION						
C1	RECOVERY WELL AND NUTRIE						
	NT INJECTION WELL IDW DI	DI		62.65*	0.00*	0.00*	62.65
	SPOSAL	75.00	TON	4,698	0	0	4,698
C2	GROUNDWATER/FREE PRODUCT			1.14*	0.00*	0.00*	1.14
	RECOVERY DISPOSAL	1.00	LS	1	0	0	1
	SUBTOTAL-SUBSPEC SECTION 13900			4,700	0	0	4,700
	TOTAL FOR SPEC SECTION 13900			4,700	0	0	4,700
	SUBTOTAL-WORK BREAKDOWN 33180902			4,700	0	0	4,700
	TOTAL FOR WORK BREAKDOWN 33180902			4,700	0	0	4,700
	COST/WBS UNIT 33180902						4,699.51

++

SUMMARY REPORT:
SPEC SECTION
PRELIMINARY

PRINTING DATE : 12/13/93 14
DATABASE USED : 01/21/92 02
PAGE NUMBER : 1
ESTIMATE NAME : MAYADPIR

ENGINEERING ESTIMATE

PROJECT: MAYPORT ALPHA DELTA PIER
LOCATION: MAYPORT, FLORIDA
ESTIMATORS: BLAKE G. SVENDSEN
PROJECT SIZE: 1.00 EA
AUTHORIZED CONSTRUCTION FUNDS: 1,000,000.00

CAT CODE:
UIC: N2
P-NO.:
DATE OF ESTIMATE: 12/13/93
BID DATE: / /

	MATERIAL		LABOR		EQUIPMENT		
	SUB SPEC SECT	SPEC SECT	SUB SPEC SECT	SPEC SECT	SUB SPEC SECT	SPEC SECT	SPEC SECT
01000 GENERAL REQUIREMENTS							
01000 GENERAL REQUIREMENTS	1,914		15,222		2,734		
SUBTOTAL SPEC SECTION 01000		1,914		15,222		2,734	19,869
01025 SHIPPING							
01025 SHIPPING	3,417		0		570		
SUBTOTAL SPEC SECTION 01025		3,417		0		570	3,987
SUBTOTAL SPEC DIVISION 01		5,331		15,222		3,303	23,856
02713 EXTERIOR WATER DISTRIBUTION SYSTEM							
02715 EXTERIOR CONDENSATE RETURN SYSTEM	585		270		147		
SUBTOTAL SPEC SECTION 02713		585		270		147	1,003
SUBTOTAL SPEC DIVISION 02		585		270		147	1,003
13900 MISCELLANEOUS SPECIAL CONSTRUCTION							
13900 MISCELLANEOUS SPECIAL CONSTRUCTION	257,780		64,804		36,019		
SUBTOTAL SPEC SECTION 13900		257,780		64,804		36,019	358,603
SUBTOTAL SPEC DIVISION 13		257,780		64,804		36,019	358,603
TOTAL		263,696		80,296		39,469	383,461

BACKUP REPORT:
GROUPS
IMINARY

PRINTING DATE : 12/13/93 14
DATABASE USED : 01/21/92 02
PAGE NUMBER : 1
ESTIMATE NAME : MAYADPIR

ENGINEERING ESTIMATE

PROJECT: MAYPORT ALPHA DELTA PIER
LOCATION: MAYPORT, FLORIDA
ESTIMATORS: BLAKE G. SVENDSEN
PROJECT SIZE: 1.00 EA
AUTHORIZED CONSTRUCTION FUNDS: 1,000,000.00

CAT CODE:
UIC: N2
P-NO.:
DATE OF ESTIMATE: 12/13/93
BID DATE: / /

		GRP QUAN	U/M	MUP/ EXT	LUP/ EXT	EUP/ EXT	TOTAL
CN CONSTRUCTION AND SITE WO							
C1				6.67*	0.00*	0.00*	6.67
	TRENCHING	1,250.00	LF	8,338	0	0	8,338
C1				0.00*	0.00*	3.41*	3.41
	INSTALL TUBING	1,250.00	LF	0	0	4,263	4,263
C1				2.31*	0.00*	0.00*	2.31
	REMOVE PAVEMENT	340.00	SF	785	0	0	785
C1				2.05*	0.00*	0.00*	2.05
	CUT PAVEMENT	1,360.00	LF	2,788	0	0	2,788
C2				5.78*	0.00*	0.00*	5.78
	PAVEMENT REPAIR	340.00	SF	1,965	0	0	1,965
C2	EXCAVATION FOR LINER INS			0.00*	0.00*	2,500.00*	2,500.00
	ERTION	1.00	LS	0	0	2,500	2,500
C2	HAZARDOUS MATERIALS STOR						
	AGE SHED W/ LIGHTS, VENT	CN		0.00*	0.00*	17,250.00*	17,250.00
	ILATION, & SUMP LINER	1.00	EA	0	0	17,250	17,250
C3	PIPE CLEANING AND INSPEC			0.00*	0.00*	5,000.00*	5,000.00
	TION	1.00	LS	0	0	5,000	5,000
	SUBTOTAL-GROUP			13,876	0	29,013	42,889
	TOTAL FOR GROUP			15,805	0	33,045	48,850
	TOTAL INCL OVERHEAD			15,805	0	33,045	48,850

++

		GRP QUAN	U/M	MUP/ EXT	LUP/ EXT	EUP/ EXT	TOTAL
DI WASTE DISPOSAL							
C1				0.00*	0.00*	65.00*	65.00
	DRUM REPLACEMENT COSTS	2.00	EA	0	0	130	130
C1	TRANSPORTATION OF WASTE			0.00*	0.00*	1.00*	1.00
	DISPOSAL SITE	1.00	LS	0	0	1	1
C1	RECOVERY WELL AND NUTRIE						
	NT INJECTION WELL IDW DI	DI		55.00*	0.00*	0.00*	55.00
	SPOSAL	75.00	TON	4,125	0	0	4,125
C2	GROUNDWATER/FREE PRODUCT			1.00*	0.00*	0.00*	1.00
	RECOVERY DISPOSAL	1.00	LS	1	0	0	1
C2				0.00*	10.00*	0.00*	10.00
	DRUM LOADING	2.00	EA	0	20	0	20
	SUBTOTAL-GROUP			4,126	20	131	4,277
	TOTAL FOR GROUP			4,700	35	149	4,884
	TOTAL INCL OVERHEAD			4,700	35	149	4,884

		GRP QUAN	U/M	MUP/ EXT	LUP/ EXT	EUP/ EXT	TOTAL
GW GROUNDWATER CONTROL							
C1				63.00*	10.00*	0.00*	73.00
	SYNTHETIC PIPE LINER	250.00	LF	15,750	2,500	0	18,250
	SUBTOTAL-GROUP			15,750	2,500	0	18,250
	TOTAL FOR GROUP			17,939	4,425	0	22,364
	TOTAL INCL OVERHEAD			17,939	4,425	0	22,364

++

		GRP QUAN	U/M	MUP/ EXT	LUP/ EXT	EUP/ EXT	TOTAL
MP MOBILIZATION							
ABB1	CONSTRUCTION INSTALLATIO			0.00*	30.00*	5.00*	35.00
	N SUPERVISION	280.00	HR	0	8,400	1,400	9,800
ABB1				0.00*	0.00*	850.00*	850.00
	CONSTRUCTION PERMITS	1.00	EA	0	0	850	850
ABB1	CONSTRUCTION SCHEDULING			0.00*	200.00*	0.00*	200.00
	(CPM)	1.00	LS	0	200	0	200
C1	MOBOLIZATION OF SUBCONTR			0.00*	0.00*	500.00*	500.00
	ACTOR	1.00	EA	0	0	500	500
C2	SINGLE PHASE 200 A POWER			180.00*	0.00*	0.00*	180.00
	CONNECTION	1.00	EA	180	0	0	180
C2	WASTE DISPOSAL AND HAULI			1,500.00*	0.00*	0.00*	1,500.00
	NG PERMIT	1.00	EA	1,500	0	0	1,500
C2				0.00*	0.00*	150.00*	150.00
	SIGNS	1.00	EA	0	0	150	150
C2	PER DIEM FOR SUBCONTRACT			150.00*	0.00*	0.00*	150.00
	OR (3 MAN CREW)	20.00	DAY	3,000	0	0	3,000
	SUBTOTAL-GROUP			4,680	8,600	2,900	16,180
	TOTAL FOR GROUP			5,331	15,222	3,303	23,856
	TOTAL INCL OVERHEAD			5,331	15,222	3,303	23,856

++

		GRP QUAN	U/M	MUP/ EXT	LUP/ EXT	EUP/ EXT	TOTAL
OM OPERATION AND MAINTENANC							
ABB1	SITE VISITS AND INSPECTI			50.00*	240.00*	0.00*	290.00
	ONS	15.00	EA	750	3,600	0	4,350
ABB1	SITE VISITS AND INSPECTI			50.00*	240.00*	0.00*	290.00
	ONS	12.00	EA	600	2,880	0	3,480
ABB2	CONTAMINATION MONITORING			745.00*	30.00*	0.00*	775.00
	SAMPLING AND ANALYSIS	68.00	EA	50,660	2,040	0	52,700
ABB2	CONTAMINATION MONITORING			745.00*	30.00*	0.00*	775.00
	SAMPLING AND ANALYSIS	36.00	EA	26,820	1,080	0	27,900
ABB2A	MICROBIOLOGY MONITORING			150.00*	30.00*	0.00*	180.00
	SAMPLING AND ANALYSIS	28.00	EA	4,200	840	0	5,040
ABB2B	NUTRIENT MONITORING SAMP			105.00*	30.00*	0.00*	135.00
	LING AND ANALYSIS	84.00	EA	8,820	2,520	0	11,340

		GRP QUAN	U/M	MUP/ EXT	LUP/ EXT	EUP/ EXT	TOTAL
ABB2C				0.00*	10.00*	0.00*	10.00
	DOSING WELL MONITORING	360.00	EA	0	3,600	0	3,600
ABB3				50.00*	0.00*	0.00*	50.00
	POWER COSTS	12.00	MO	600	0	0	600
ABB3				50.00*	0.00*	0.00*	50.00
	POWER COSTS	12.00	MO	600	0	0	600
ABB4	WATER COST @ $1.30 PER			39.00*	0.00*	0.00*	39.00
	1000 GALLONS	365.00	DAY	14,235	0	0	14,235
ABB4	WATER COST @ $1.30 PER			39.00*	0.00*	0.00*	39.00
	1000 GALLONS	365.00	DAY	14,235	0	0	14,235
ABB5				10.00*	240.00*	0.00*	250.00
	MONTHLY REPORTS	12.00	EA	120	2,880	0	3,000
ABB6				10.00*	240.00*	0.00*	250.00
	MONTHLY REPORTS	12.00	EA	120	2,880	0	3,000
	SUBTOTAL-GROUP			121,760	22,320	0	144,080
	TOTAL FOR GROUP			138,685	39,506	0	178,191
	TOTAL INCL OVERHEAD			138,685	39,506	0	178,191

++

PI FLOW CONTROL, MEASUREMEN

		GRP QUAN	U/M	MUP/ EXT	LUP/ EXT	EUP/ EXT	TOTAL
C1	REDUCED PRESSURE BACKFLO			0.00*	0.00*	300.00*	300.00
	W PREVENTER	1.00	EA	0	0	300	300
C1	55 GALLON DRUM PRODUCT C			0.00*	0.00*	65.00*	65.00
	OLLECTION TANK ASSEMBLY	2.00	EA	0	0	130	130
C1	PVC PIPE SCH 80 1.5 INCH			3.75*	5.65*	0.00*	9.40
	DIAMETER	150.00	LF	563	848	0	1,410
C2				15.00*	10.95*	0.00*	25.95
	GATE VALVES	4.00	EA	60	44	0	104
C3				0.00*	0.00*	32.90*	32.90
	FLOW METERS	3.00	EA	0	0	99	99
C4				0.00*	0.00*	34.90*	34.90
	PREASURE GAUGE	1.00	EA	0	0	35	35
C4	PVC 90 DEGREE SCH 80 ELB			1.90*	15.65*	0.00*	17.55
	OW JOINT	9.00	EA	17	141	0	158
C5				0.00*	0.00*	10.00*	10.00
	SAMPLING PORTS	2.00	EA	0	0	20	20
C6				0.00*	0.00*	198.00*	198.00
	WATER JET EDUCTORS	2.00	EA	0	0	396	396
C7				0.00*	0.00*	250.00*	250.00
	SCREEN FILTER	1.00	EA	0	0	250	250
C7	OXYGEN/NUTRIENT DISTRIBU						
	TION TUBING		PI	120.00*	0.00*	0.00*	120.00
	1 ROLL @ 6000 FEET	1.00	RL	120	0	0	120
DJGLO	6 INCH TAPPING SADDLE			27.12*	20.71	11.64	59.47
	TAP SIZE TO 2 INCH	1.00	EA	27	21	12	59

		GRP QUAN	U/M	MUP/ EXT	LUP/ EXT	EUP/ EXT	TOTAL
DJGLU				294.04*	30.68	17.25	341.97
	6X4 TAPPING SLEEVE	1.00	EA	294	31	17	342
DJGMYJ				192.76*	55.22	31.05	279.03
	4 INCH TAPPING VALVE MJ	1.00	EA	193	55	31	279
DJGMYO				0.00*	46.01	69.38	115.39
	TAP 4 INCH HOLE IN PIPE	1.00	EA	0	46	69	115
	SUBTOTAL-GROUP			1,274	1,185	1,359	3,817
	TOTAL FOR GROUP			1,451	2,097	1,548	5,095
	TOTAL INCL OVERHEAD			1,451	2,097	1,548	5,095

++

SA START UP SAMPLING AND

		GRP QUAN	U/M	MUP/ EXT	LUP/ EXT	EUP/ EXT	TOTAL
ABB1	UP STREAM AND DOWN STREA						
	M SAMPLES FROM STORM SEW	SA		745.00*	50.00*	0.00*	795.00
	ER	6.00	EA	4,470	300	0	4,770
ABB1	GROUND WATER SAMPLING AN			745.00*	30.00*	0.00*	775.00
	D ANALYSIS	9.00	EA	6,705	270	0	6,975
ABB1A	MICROBIOLOGICAL SAMPLING			150.00*	30.00*	0.00*	180.00
	AND ANALYSIS	7.00	EA	1,050	210	0	1,260
ABB2A	MICROBIOLOGY MONITORING			150.00*	30.00*	0.00*	180.00
	SAMPLING AND ANALYSIS	77.00	EA	11,550	2,310	0	13,860
ABB2B	NUTRIENT MONITORING SAMP			105.00*	30.00*	0.00*	135.00
	LING AND ANALYSIS	105.00	EA	11,025	3,150	0	14,175
ABB2C				0.00*	10.00*	0.00*	10.00
	DOSING WELL MONITORING	450.00	EA	0	4,500	0	4,500
	SUBTOTAL-GROUP			34,800	10,740	0	45,540
	TOTAL FOR GROUP			39,637	19,010	0	58,647
	TOTAL INCL OVERHEAD			39,637	19,010	0	58,647

++

TM TREATMENT MATERIALS

		GRP QUAN	U/M	MUP/ EXT	LUP/ EXT	EUP/ EXT	TOTAL
C1	INSITU BIODEGRADATION WI						
	TH MAGNESIUM PEROXIDE PO	TM		6.00*	0.00*	0.00*	6.00
	WDER	2,500.00	KG	15,000	0	0	15,000
C1	IN SITU BIODEGRADATION						
	W/ HYDROGEN PEROXIDE	TM		225.00*	0.00*	0.00*	225.00
	SOLUTION	30.00	DR	6,750	0	0	6,750
	SUBTOTAL-GROUP			21,750	0	0	21,750
	TOTAL FOR GROUP			24,773	0	0	24,773
	TOTAL INCL OVERHEAD			24,773	0	0	24,773

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GROUPS DATABASE DATE: 01/21/92 02
PAGE NUMBER : 5

		GRP QUAN	U/M	MUP/ EXT	LUP/ EXT	EUP/ EXT	TOTAL
WD WELL DRILLING							
C1	MOBILIZATION AND CREW			0.00*	0.00*	1,250.00*	1,250.00
	PER DIEM	1.00	EA	0	0	1,250	1,250
C3				40.00*	0.00*	0.00*	40.00
	WELL DEVELOPMENT	30.00	EA	1,200	0	0	1,200
C3	4" PVC DOSING WELLS						
	W/ 10' OF SCREEN AND FLU	WD		410.00*	0.00*	0.00*	410.00
	SH COVERS	30.00	EA	12,300	0	0	12,300
	SUBTOTAL-GROUP			13,500	0	1,250	14,750
	TOTAL FOR GROUP			15,377	0	1,424	16,800
	TOTAL INCL OVERHEAD			15,377	0	1,424	16,800

++

NO ERRORS IN ESTIMATE MAYADPIR

APPENDIX C

CONTAMINANT ASSESSMENT REPORTS, SIMA, NAVSTA MAYPORT

DRAFT
CONTAMINATION ASSESSMENT REPORT

MAYPORT NAVAL STATION
BUILDING 1490 - SIMA SHOP

MAYPORT, FLORIDA

PREPARED FOR

UNITED STATES NAVY
SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CHARLESTON, SOUTH CAROLINA

PREPARED BY

U.S. ARMY CORPS OF ENGINEERS
SAVANNAH DISTRICT
SAVANNAH, GEORGIA

MAY 1992

5/7/92
may1490.car

EXECUTIVE SUMMARY

The Shore Intermediate Maintenance Activity (SIMA) Shop is located approximately 300 feet east of the ship basin and Pier Echo, on Massey Ave. at Mayport Naval Station, Mayport, Florida. In October of 1989, while installing compliance monitoring wells around a 1,000-gallon underground storage tank containing waste oil, petroleum odors were detected in the soil around the tank.

A contamination assessment was performed by the U.S. Army Corps of Engineers, Savannah District during February through April 1991. The purpose of the assessment was to determine the degree and extent of contamination to soil and ground water caused by petroleum products suspected of leaking from the underground storage tank (UST).

Twelve soil borings and five monitoring wells were installed at the site during contamination assessment. Soil samples were analyzed using the OVA headspace method. Ground-water samples were collected and analyzed for petroleum constituents of the Florida kerosene analytical group. The following Executive Summary Map indicates the locations of monitoring wells and the results of laboratory analyses. The findings, conclusions, and recommendations of the enclosed Contamination Assessment Report (CAR) are summarized below:

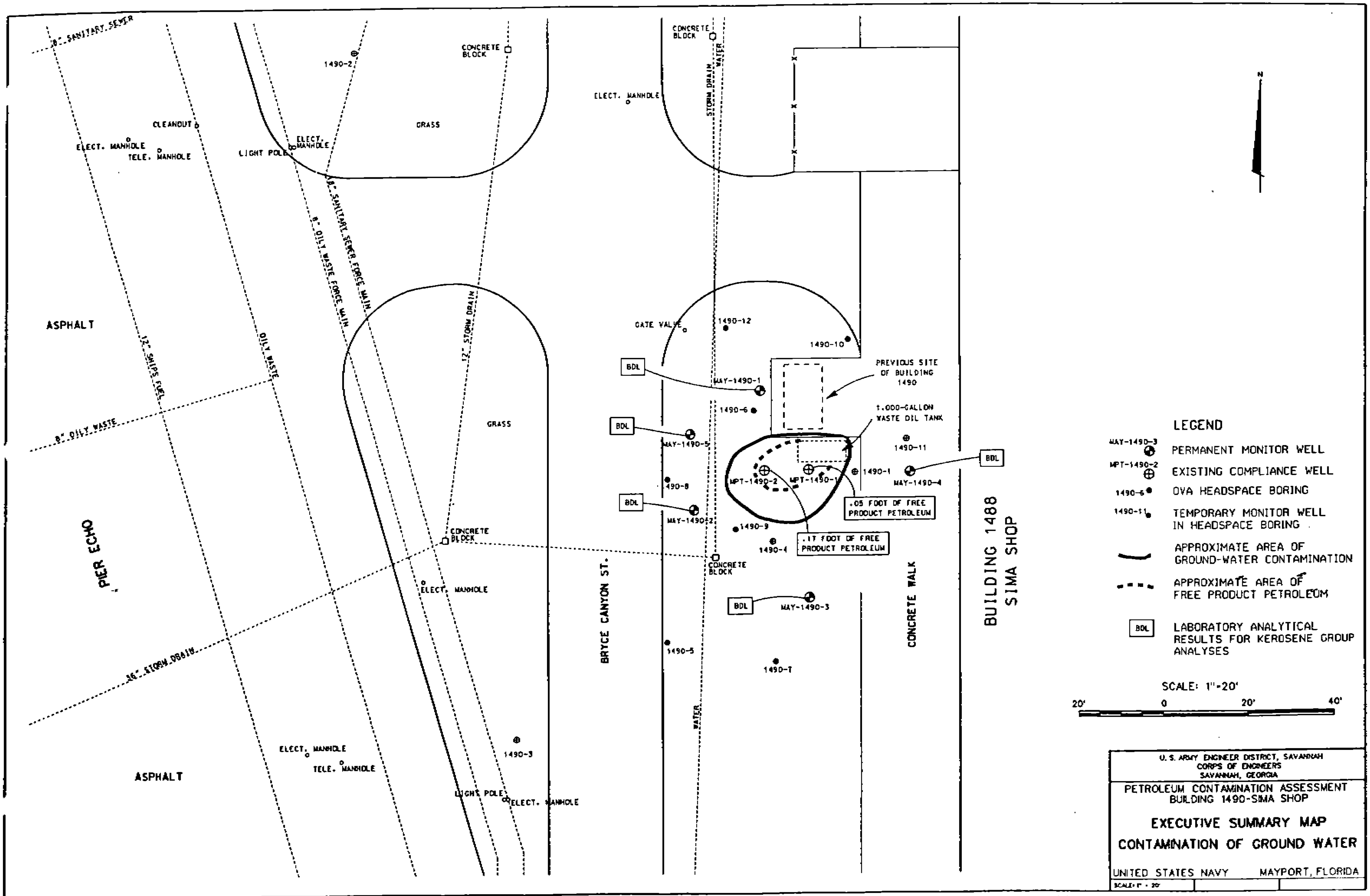
Findings

- The source of contamination has been abated. The contents of the UST have been removed, and the tank was taken out of service.

- Free product petroleum was found in two existing compliance monitoring wells near the UST. The maximum thickness of free product measured in the wells was approximately 0.17 foot.

- The only constituent of the Florida kerosene analytical group found in additional monitoring wells installed during contamination assessment was lead. Total lead concentrations ranged from .005 to .017 ppm, which is below the regulatory standard of .05 ppm.

- The contamination on the site remains entirely on Navy property.


LEGEND
MAY-1490-3 PERMANENT MONITOR WELL
MPT-1490-2 EXISTING COMPLIANCE WELL
1490-6 OVA HEADSPACE BORING
1490-11 TEMPORARY MONITOR WELL IN HEADSPACE BORING
APPROXIMATE AREA OF GROUND-WATER CONTAMINATION
APPROXIMATE AREA OF FREE PRODUCT PETROLEUM
BDL LABORATORY ANALYTICAL RESULTS FOR KEROSENE GROUP ANALYSES
SCALE: 1"=20'
20' 0 20' 40'
U. S. ARMY ENGINEER DISTRICT, SAVANNAH CORPS OF ENGINEERS SAVANNAH, GEORGIA
PETROLEUM CONTAMINATION ASSESSMENT BUILDING 1490-SIMA SHOP
EXECUTIVE SUMMARY MAP
CONTAMINATION OF GROUND WATER
UNITED STATES NAVY
MAYPORT, FLORIDA
BUILDING 1488
SIMA SHOP
CONCRETE WALK
BRYCE CANYON ST.
PIER ECHO
ASPHALT
GRASS
PREVIOUS SITE OF BUILDING 1490
1,000-GALLON WASTE OIL TANK
.05 FOOT OF FREE PRODUCT PETROLEUM
.17 FOOT OF FREE PRODUCT PETROLEUM
MAY-1490-1
MAY-1490-2
MAY-1490-3
MAY-1490-4
MAY-1490-5
MPT-1490-1
MPT-1490-2
1490-1
1490-2
1490-3
1490-4
1490-5
1490-6
1490-7
1490-8
1490-9
1490-10
1490-11
1490-12
BDL
GATE VALVE
CONCRETE BLOCK
ELECT. MANHOLE
TELE. MANHOLE
LIGHT POLE
CLEANOUT
STORM DRAIN
WATER
12" STORM DRAIN
36" STORM DRAIN
8" SANITARY SEWER
18" SANITARY SEWER FORCE MAIN
8" OILY WASTE FORCE MAIN
OILY WASTE
8" OILY WASTE
12" SHIPS FUEL
N

Conclusions

- OVA headspace analyses at the site indicate that soil contamination is located predominantly within the tank backfill and soil immediately adjacent to the backfill.

- The configuration of the ground-water contamination suggests that the contaminant plume is approximately 20 by 30 feet in area, and is moving generally down-gradient to the west-southwest, away from the source area.

Recommendations

- Because monitoring wells at the site indicated that free product petroleum exists in the immediate area of the UST backfill and adjacent soil, it is recommended that a Remedial Action Plan (RAP) be prepared to address the contamination.

FOREWORD

Subtitle I of the Hazardous and Solid Waste Amendments (HSWA) of 1984 to the Solid Waste Disposal Act (SWDA) of 1965 established a national regulatory program for managing underground storage tanks (UST's) containing hazardous materials, especially petroleum products. Hazardous wastes stored in UST's were already regulated under the Resource Conservation and Recovery Act (RCRA) of 1976, which was also an amendment to SWDA. Subtitle I requires that the U.S. Environmental Protection Agency (USEPA) promulgate UST regulations. The program was designed to be administered by the individual states, who were allowed to develop more stringent standards, but not less stringent standards. Local governments were permitted to establish regulatory programs and standards that are more stringent, but not less stringent than either State or Federal regulations. The USEPA UST regulations are found in the Code of Federal Regulations, Title 40, Part 280 (40 CFR 280) (Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks) and Title 40 CFR 281 (Approval of State Underground Storage Tank Programs). Title 40 CFR 280 was revised and published on 23 September 1988 and became effective 22 December 1988.

The Navy's UST Program policy is to comply with all Federal, State, and local regulations pertaining to UST's. This report was prepared to satisfy the requirements of the Florida Department of Environmental Regulation (FDER) Chapter 17-770, Florida Administrative Code (FAC) (State Underground Petroleum Environmental Response) regulations on petroleum contamination in Florida's environment as a result of spills or leaking tanks or piping.

Questions regarding this report should be addressed to the Commanding Officer, Mayport Naval Station, Jacksonville, Florida, or to Southern Division, Naval Facilities Engineering Command (SOUTHNAVFACENGCOM), Code 1823, at AUTOVON 563-0528 or 803-743-0528.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACRONYMS AND ABBREVIATIONS

The following list contains many of the acronyms, abbreviations, and units of measure used in this report.

BDL	below detection limits
BETX	benzene, ethyl benzene, toluene, and xylenes
bls	below land surface
CA	Contamination Assessment
CAP	Contamination Assessment Plan
CAR	Contamination Assessment Report
CESAS	Corps of Engineers, South Atlantic Division, Savannah District
CFR	Code of Federal Regulations
CH	High plasticity clay (Unified Soil Classification System)
CL	Low plasticity clay (Unified Soil Classification System)
COE	Corps of Engineers
CompQAP	Comprehensive Quality Assurance Plan
°C	degrees Celsius
EDB	ethylene dibromide
FAC	Florida Administrative Code
FDER	Florida Department of Environmental Regulation
ft/day	feet per day
GC	gas chromatograph
gpd/ft	gallons per day per foot
HSWA	Hazardous and Solid Waste Amendments of 1984
K	hydraulic conductivity
MH	High plasticity silt (Unified Soil Classification System)
ML	Low plasticity silt (Unified Soil Classification System)
mlw	mean low water
msl	mean sea level
MGD	Million gallons per day
MTBE	methyl-tert-butyl-ether
OH	High plasticity organic clay (Unified Soil Classification System)
OL	Low plasticity organic silt or clayey silt (Unified Soil Classification System)
OVA	organic vapor analyzer
OVM	organic vapor monitor (see PID)
PAH	polynuclear aromatic hydrocarbons
PCA	Preliminary Contamination Assessment
PCAR	Preliminary Contamination Assessment Report
PID	Photo-ionization Detector
ppb	parts per billion
ppm	parts per million
PVC	polyvinyl chloride
RAP	Remedial Action Plan
RCRA	Resource Conservation and Recovery Act
SC	Clayey sand (Unified Soil Classification System)
SM	Silty sand (Unified Soil Classification System)
SP	Poorly graded sand (Unified Soil Classification System)
SOUTHNAVFACENGCOM	Southern Division Naval Facilities Engineering Command
SPT	standard penetration test
SWDA	Solid Waste Disposal Act of 1965

ACRONYMS AND ABBREVIATIONS (cont'd.)

T	transmissivity
TRPH	total recoverable petroleum hydrocarbons
µg/l	micrograms per liter
µmhos/cm	micromhos per centimeter
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	underground storage tank
V	pore water velocity
VOA	volatile organic aromatic

1.0 INTRODUCTION

The U.S. Army Corps of Engineers, Savannah District was contracted by Southern Division, Naval Facilities Engineering Command, Charleston, South Carolina, to perform a contamination assessment at the Shore Intermediate Maintenance Activity (SIMA) Shop, Mayport Naval Station, Mayport, Florida..

The purpose of the assessment was to determine the degree and extent of contamination to soil and ground water caused by petroleum products suspected of originating from an underground storage tank at the site. The assessment of the site was conducted in several phases, from February through April 1991 and included:

- Performing headspace analysis of soils to determine the extent of soil contamination;
- The installation and sampling of monitoring wells to determine the vertical and horizontal extent of petroleum contamination of ground water;
- The collection of water level data to determine direction of ground-water flow;
- Performing recovery testing on selected monitoring wells to estimate aquifer characteristics; and
- Performing a survey of potable water wells in the vicinity of the site.

The work presented in this contamination assessment report (CAR) was performed in compliance with Chapter 17-770, Florida Administrative Code (FAC), State Underground Petroleum Environmental Response, and Florida Department of Environmental Regulation (FDER) "Guidelines for Assessment and Remediation of Petroleum Contaminated Soils."

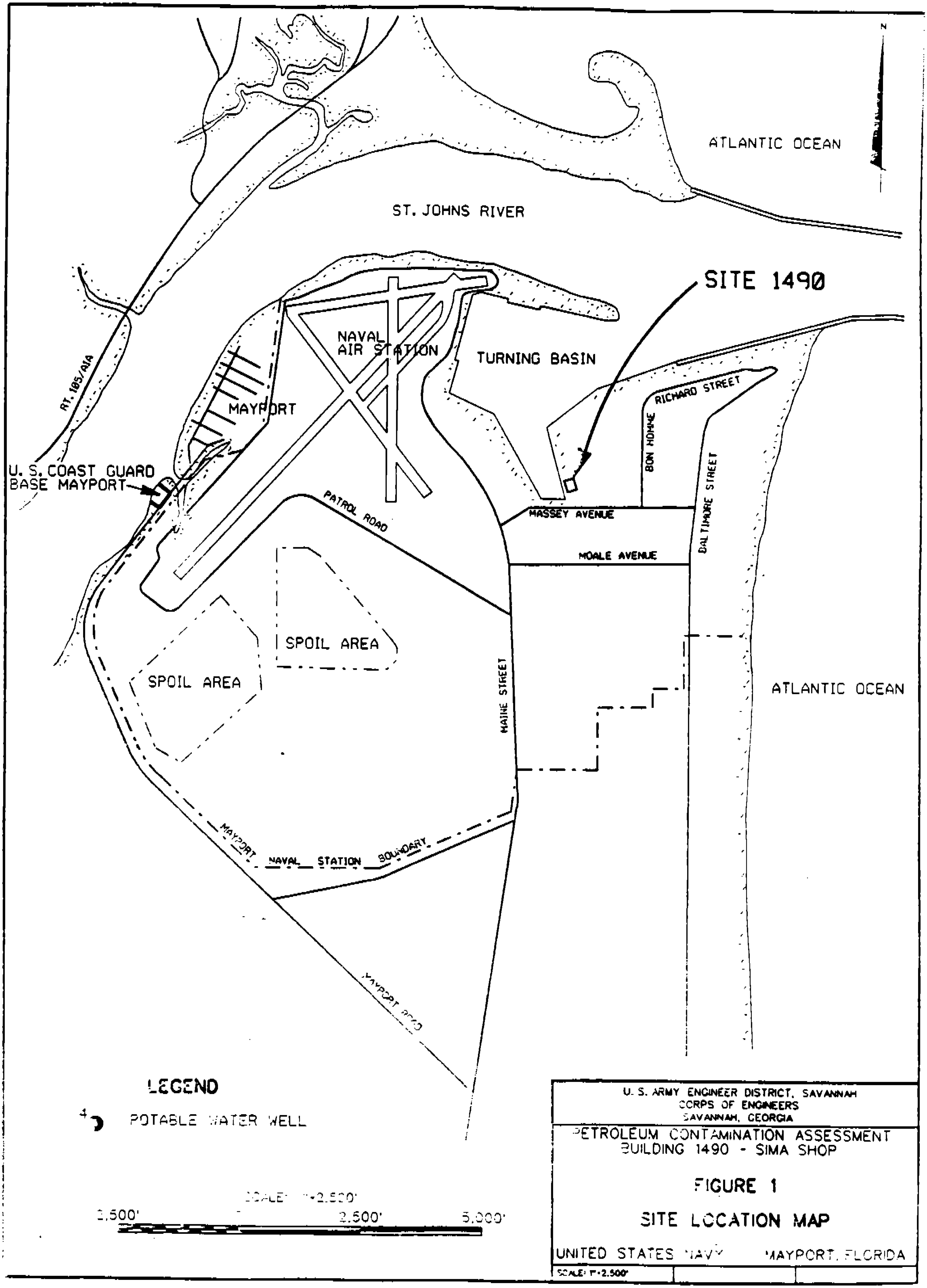
2.0 BACKGROUND

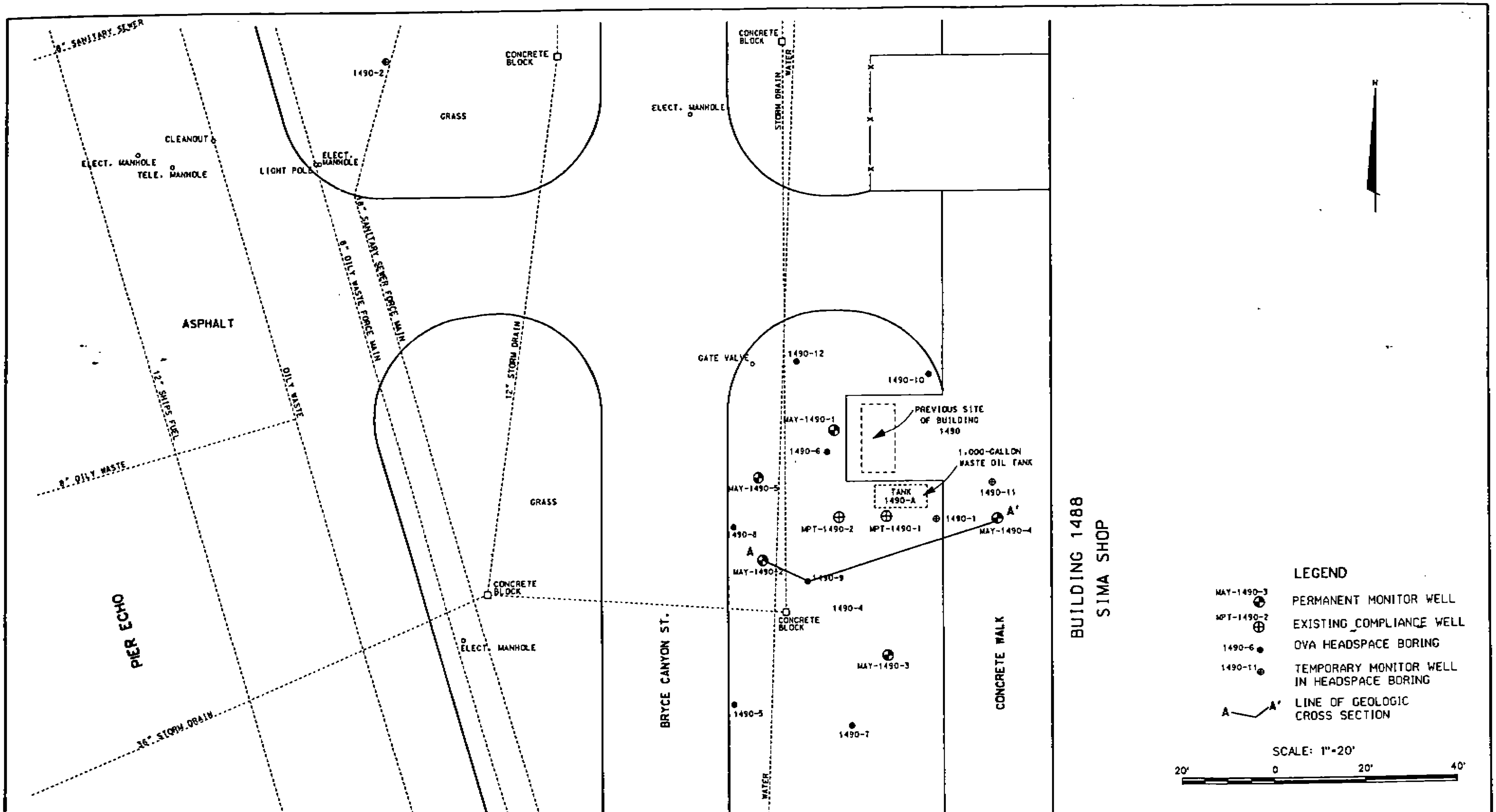
2.1 Site Description

Mayport Naval Station is located approximately 16 miles northeast of Jacksonville, Florida, at the mouth of the St. Johns River (see figure 1). The SIMA Shop (Building 1488) site is located approximately 300 feet east of the ship basin and Pier Echo, on Massey Ave. The SIMA Shop is a full service machine shop and repair/refit facility which provides services and materials to ships at the Naval Station. The site of this investigation is an area around an underground storage tank (tank 1490-A) located immediately to the west of the SIMA shop, between the shop and Pier Echo. Building 1490, for which this investigation is designated, no longer exists. Building 1490 was located on a concrete slab (still existing) immediately to the north of tank 1490-A.

2.2 Site History

Tank 1490-A is a 1,000-gallon steel, underground waste oil storage tank, which is part of an oil/water separator system connected to floor drains in the SIMA Shop. Three compliance wells (MPT-1490-1, MPT-1490-2, and MPT-1490-3) were installed around the tank in October of 1989 (MPT-1490-3 was later destroyed). While installing the wells, petroleum odors were detected in the soil. As a result of these findings, the tank contents were removed, and the tank was taken out of service. A contamination assessment was begun at the site in February 1991 to determine the nature and extent of any petroleum contamination as required by Chapter 17-770, FAC.


ATLANTIC OCEAN
ST. JOHNS RIVER
SITE 1490
NAVAL AIR STATION
TURNING BASIN
RICHARD STREET
BON HOMME
BALTIMORE STREET
MAYPORT
U. S. COAST GUARD BASE MAYPORT
PATROL ROAD
MASSEY AVENUE
MOALE AVENUE
SPOIL AREA
SPOIL AREA
MAINE STREET
ATLANTIC OCEAN
MAYPORT NAVAL STATION BOUNDARY
MAYPORT ROAD
LEGEND
POTABLE WATER WELL
2,500'
2,500'
5,000'
U. S. ARMY ENGINEER DISTRICT, SAVANNAH
CORPS OF ENGINEERS
SAVANNAH, GEORGIA
PETROLEUM CONTAMINATION ASSESSMENT
BUILDING 1490 - SIMA SHOP
FIGURE 1
SITE LOCATION MAP
UNITED STATES NAVY
MAYPORT, FLORIDA
SCALE: 1"=2,500'



U. S. ARMY ENGINEER DISTRICT, SAVANNAH
CORPS OF ENGINEERS
SAVANNAH, GEORGIA

PETROLEUM CONTAMINATION ASSESSMENT
BLDG. 1490-SIMA SHOPS

FIGURE 2
SITE PLAN

UNITED STATES NAVY MAYPORT, FLORIDA
SCALE: 1" = 20'

3.0 SITE CONDITIONS

3.1 Physiography

Regional physiography is discussed in appendix A. The site lies within the Coastal Lowland physiographic division of northeastern Florida, which runs roughly parallel to the coastline and extends from the Atlantic Ocean to just west of downtown Jacksonville. Site elevations range from approximately 6 to 9 feet above msl. Site surface drainage is controlled by the Ship Basin (St. Johns River) to the west, and shallow drainage ditches to the west between Pier Echo and the site.

3.2 Regional Hydrogeology

The southeast Georgia and northeast Florida area is underlain by two main aquifer systems: the Surficial aquifer system and the Floridan aquifer system. A third aquifer system, the Southeastern Coastal Plain aquifer system, underlies the Floridan aquifer system in southeast Georgia, portions of northeast Florida, and the Florida panhandle. These systems are further discussed in appendix A.

3.3 Site Hydrogeology

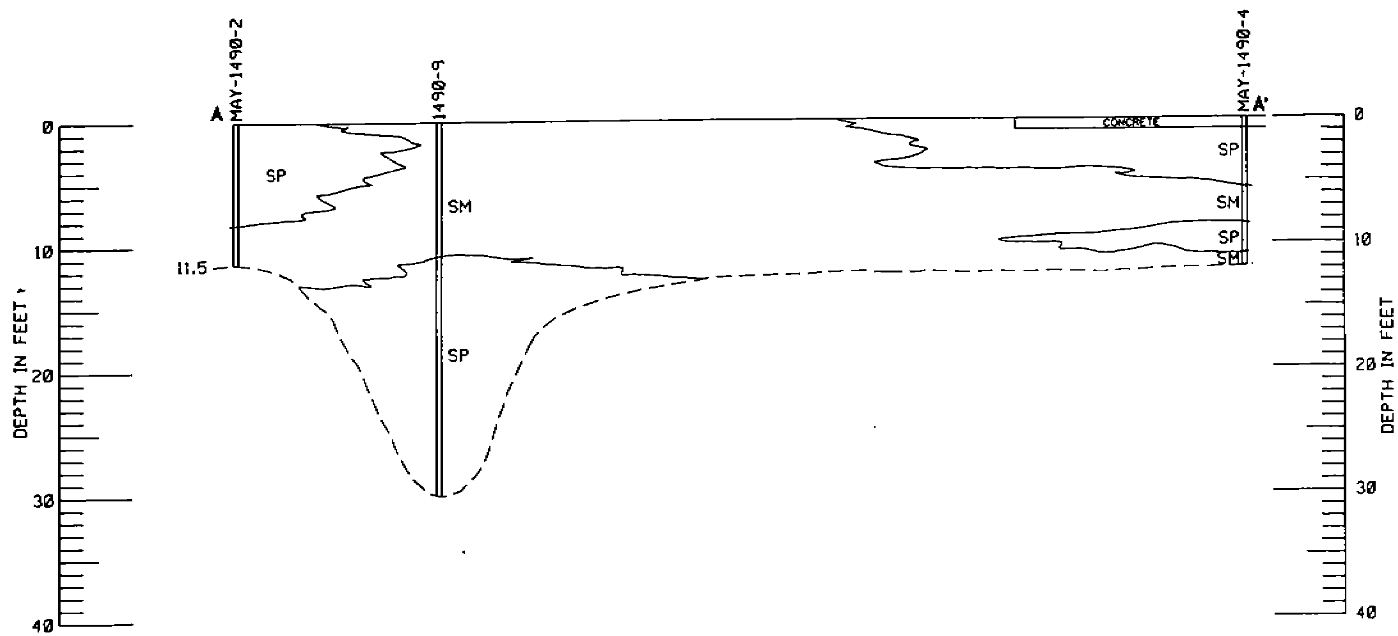
Mayport Naval Station is underlain by three water-bearing zones; the surficial aquifer, a shallow rock aquifer, and the Floridan aquifer system.

The surficial aquifer consists generally of unconsolidated sands and silty sands to an approximate depth of 30 feet below land surface (bls). Figure 3 depicts the generalized geology encountered during drilling activities at the site (see appendix C for lithologic logs). Soil borings indicate the near-surface geology, to a depth of approximately 30 feet bls, consists of brown fine grained silty sand (SM), and fine grained, poorly graded sand (SP), with occasional shell fragments. No confining units were encountered during drilling activities at the site.

The depth to the water table at the site varied from approximately 2.5 feet to 4.5 below land surface. The general direction of ground-water flow at the site, as determined from water level measurements obtained from monitor wells during the investigation, appears to be to the west-southwest.

Although the shallow rock aquifer was not encountered during drilling at the site, it is described as consisting of permeable deposits of sand, shell, and limestone within and below the Hawthorn Formation (Fairchild, 1972). A boring taken to 51 feet bls at another site on the Naval Station (Building 265), approximately 1,600 feet to the southeast, encountered a soft, light gray, sandy limestone at approximately 50 feet bls. This limestone is believed to be the top of the shallow rock aquifer in the area. The general direction of ground-water flow in the shallow rock aquifer is believed to be to the southeast.

The Floridan aquifer system is the principal source of fresh water in northeast Florida. It is confined from above by clay units within the Hawthorn Formation. Several water supply wells drilled to approximately 1,000 feet in depth on the Naval Station indicate a consistent clayey marl and sandy clay zone from about 200 feet bls to the top of the Floridan at about 400 to 420 feet bls. The top of the Floridan is indicated on logs of these wells by a dark gray to greenish gray surface of hard, weathered limestone (indicated to be the top of the Ocala Formation) capping softer white limestone. The logs indicate that the sediments from the top of the aquifer down to about 1,000 feet where the wells bottom out, consist of soft to hard, white to brown limestone of varying porosity. Ground-water flow in the Floridan is thought to be generally toward areas of heavy pumping in Jacksonville. However, a severe depression in the potentiometric surface due to pumping makes it difficult to predict the direction of local flow in the aquifer (Geraghty & Miller, 1985). Very little recharge to the Floridan occurs in the Duval County area. Recharge to the aquifer is from up-dip areas to the west where units of the aquifer are nearer to the surface. The potentiometric surface of the upper Floridan in the Mayport area was approximately 40 feet above mean sea level in 1980 (Krause and Randolph, 1989), indicating an upward gradient from the Floridan to the overlying shallower aquifers.



SCALE: 1"=10' VERT.
1"=7' HORIZ.

LEGEND

SM SILTY SAND
SP POORLY GRADED SAND

U. S. ARMY ENGINEER DISTRICT, SAVANNAH
CORPS OF ENGINEERS
SAVANNAH, GEORGIA

PETROLEUM CONTAMINATION ASSESSMENT
BUILDING 1490 - SIMA SHOP

FIGURE 3

GEOLOGIC CROSS SECTION

UNITED STATES NAVY MAYPORT, FLORIDA

SCALE: AS SHOWN

4.0 SITE ASSESSMENT METHODS

4.1 Soil Sampling

A series of 11 shallow soil borings (1490-1 through 1490-8, 1490-11 and 1490-12), ranging from approximately 4 feet to 7 feet deep, were drilled at the site (see figure 2) to determine the horizontal and vertical extent of petroleum contamination in the soil. In addition to the shallow borings, one boring (1490-9) was drilled using mud-rotary equipment, and sampled continuously using a splitspoon sampler, to 30 feet bls to obtain information on site stratigraphy. The log for boring 1490-9 is contained in appendix C. Appendix B contains additional information on soil boring methods.

4.2 Monitoring Well Installation

Five temporary monitoring wells were installed in soil borings 1490-1 through 1490-4 and 1490-11 during soil contamination assessment. These wells were set to approximate depths of 8 to 10 feet, depending on the depth to the water table, and were used to determine ground-water gradient and flow direction during site investigations and to help guide the location and depth of permanent wells installed later.

Based on the findings of the soil borings and headspace analyses, five permanent monitoring wells (MAY-1490-1 through MAY-1490-5) were installed to detect and characterize ground-water contamination at the site. Monitor well installation procedures are discussed in appendix B, and monitor well installation reports are contained in appendix C. Pertinent data on these permanent monitor wells can also be found in table 1.

4.3 Ground-water Elevation Survey

The elevation and gradient of the water table was determined by referencing the top of the temporary monitor well casings to a U.S. Naval Station bench mark, number 21. This bench mark is located in front of the Naval Supply Center, on Massey Avenue approximately one block east of the SIMA Shop. The bench mark has a mean sea level (msl) elevation of 10.14 feet.

A water table contour map based on ground-water elevation measurements (see table 1) from the permanent monitor wells, taken on 22 May 1991, is depicted in figure 4. Procedures for ground-water level measurements are contained in appendix B.

TABLE 1

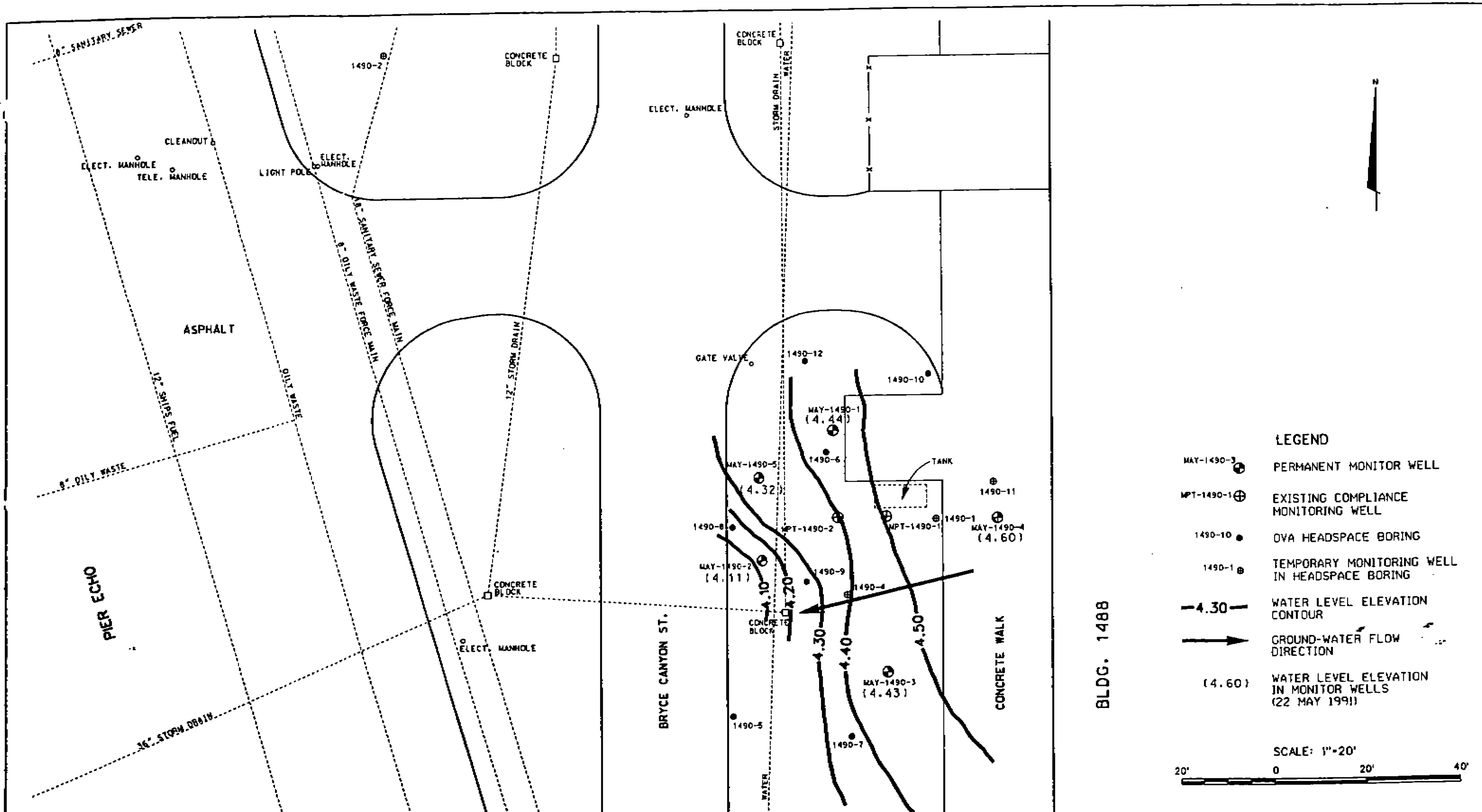
MONITOR WELL
WATER LEVEL DATA

BUILDING 1490
MAYPORT NAVAL STATION
MAYPORT, FLORIDA

22 MAY 1991

Well No.	Total Depth of Well BLS (ft.)	Top of Casing to Ground Surface (ft.)	Surveyed Top of Casing Elevation (msl)	Depth to Water from Top of Casing (ft.)	Elevation of Water Table (msl)
MAY-1490-1	11.00	Flush	7.70	3.26	4.44
MAY-1490-2	11.90	"	7.00	2.89	4.11
MAY-1490-3	12.21	"	7.89	3.46	4.43
MAY-1490-4	12.82	"	8.93	4.33	4.60
MAY-1490-5	22.96	"	7.06	2.74	4.32

Notes: - BLS = Below Land Suurface
- flush = Level with ground surface



U. S. ARMY ENGINEER DISTRICT, SAVANNAH
CORPS OF ENGINEERS
SAVANNAH, GEORGIA

PETROLEUM CONTAMINATION ASSESSMENT
BUILDING 1490 - SIMA SHOP

FIGURE 4

WATER TABLE CONTOURS

UNITED STATES NAVY MAYPORT, FLORIDA

SCALE: 1" = 20'

4.4 Ground-water Sampling

On 5 March 1991, a composite ground-water sample (with some floating free product petroleum) was collected from existing compliance monitoring wells MPT-1490-1 and MPT-1490-2 and analyzed for aliphatic solvents (8015), along with an IR fingerprint scan for total petroleum hydrocarbons (TPH). Since wells MPT-1490-1 and MPT-1490-2 had at times indicated up to 0.05 and 0.17 foot respectively, of free product petroleum, and because the underground tank at the site had been used for storage of waste oil, this sample was collected to better define the site contaminants.

A ground-water sample was later collected (26 June 1991) from existing compliance well MPT-1490-2, and analyzed for priority pollutant organics (EPA methods 624/625, without pesticides), arsenic, cadmium, chromium and lead, and total petroleum hydrocarbons (EPA method 418.1).

Ground-water samples were collected on 11 January 1992 from the five additional permanent monitor wells (MAY-1490-1 through MAY-1490-5) installed during this contamination assessment. These samples were analyzed for the Florida Kerosene Group (FDER 17-770).

All samples were properly preserved, stored on ice, and delivered to the laboratory for analysis. Chain of custody was maintained on the samples throughout the sampling period. Procedures for monitor well sampling are contained in appendix B.

4.5 Ground-water Hydraulic Conductivity Testing

Slug tests were conducted on monitoring wells MAY-1490-1 and MAY-1490-2 to determine of the hydraulic conductivity of the surficial aquifer surrounding the wells. Procedures for conducting slug tests are further discussed in appendix B.

4.6 Tidal Influence Monitoring

Two of the ground-water monitoring wells at the site were monitored over a 24-hour period (9-10 December 1991) to determine the influence on the surficial aquifer at the site from tidal changes in the ship basin (St. Johns River), which is approximately 300 feet to the west. A Hermit data logger transducer was placed in monitor wells MAY-1490-1 and MAY-1490-5 to measure water level changes during two complete tide cycles. The data logger was set to log data at 15-minute intervals. The response of the water level in the wells, plotted against time, was compared with the predicted tidal changes for the Mayport area on the dates of data gathering.

5.0 RESULTS OF CONTAMINATION ASSESSMENT

5.1 Contaminant Plume Delineation and Characterization

The results of the Organic Vapor Analyzer (OVA) analyses of soil samples taken during contamination assessment are shown in table 2. These analyses indicated very little, if any, soil contamination outside the area of the tank backfill. None of the soil samples obtained from the headspace borings exceeded the criterion for "excessively contaminated soil" (OVA results > 50 ppm for kerosene group contaminants) as defined in Chapter 17-770.200(2).

Up to 0.05 foot and 0.17 foot of free product petroleum was found in existing compliance wells MPT-1490-1 and MPT-1490-2, respectively; however, since no other wells indicated free product or a petroleum sheen, the area of free product or residual petroleum is believed to be limited to the tank backfill and an area immediately down-gradient of the west end of the tank (see figure 5).

The composite ground-water/free product sample collected from existing compliance wells MPT-1490-1 and MPT-1490-2, which was analyzed for aliphatic solvents (EPA 8015), along with an infra-red (IR) fingerprint scan for total petroleum hydrocarbons (TPH), indicated the sample was below detection limit (BDL) for acetone, ethanol, isopropanol, methanol and n-butyl acetate. The IR scan, which was performed on a thin, floating lens of petroleum in the sample, detected 532 ppm of total petroleum hydrocarbons (TPH). This lens of petroleum consisted of no. 2 fuel oil and lube oil, and comprised less than 1% of the entire ground-water/free product sample.

The analyses for priority pollutant organics (EPA 624/625) and metals, and TPH on the sample from compliance well MPT-1490-2, indicated that arsenic, which was detected at a concentration of 0.028 ppm, was the only identified compound above detection limit. The regulatory limit for arsenic, under the State of Florida Primary Drinking Water Standards, is 50 ppb. Ten unidentified organic compounds were also indicated in the analysis, at concentrations ranging from 4 to 13 ppb. The absence of petroleum compounds in the priority pollutant analyses is believed to be due to the fact that the well was bailed before sampling, which effectively removed any floating petroleum constituents.

A summary of laboratory results of analyses for the Florida Kerosene Group (DER 17-770) for ground-water samples is presented in table 3. These analyses indicated all of the permanent monitor wells (MAY-1490-1 through MAY-1490-5) installed during contamination assessment were below detection limits (BDL) for volatile organic halocarbons (VOH's), volatile organic aromatics (VOA's), and polynuclear aromatic hydrocarbons (PAH's). Analyses for total lead indicated no samples above the regulatory limit of 0.05 ppm.

A complete copy of all laboratory analytical results and chain-of-custody documentation is contained in appendix E.

The approximate horizontal extent of ground-water contamination, based on laboratory analyses of monitor well samples, is indicated on figure 5. The approximate vertical extent of contamination, as defined by laboratory analyses of ground water from deep well MAY-1490-5, appears to be no deeper than 18.0 feet bls.

TABLE 2

SUMMARY OF SOIL HEADSPACE ANALYSIS

BUILDING 1490
MAYPORT NAVAL STATION
MAYPORT, FLORIDA

Sample No.	Depth (feet)	OVA Headspace Reading	OVA Headspace Reading With Carbon Filter	Corrected OVA Headspace Reading (*)	PID Reading
1490-1	1.0-1.5	0	NR	--	NR
	3.0-3.5	0	NR	--	NR
1490-2	1.0-1.5	0	NR	--	NR
	2.5-3.0	0	NR	--	NR
1490-3	1.0-1.5	0	NR	--	NR
	2.5-3.0	0	NR	--	NR
1490-4	1.0-1.5	0	NR	--	NR
	2.5-3.0	1.0	NR	--	NR
	3.0-3.5	0.2	NR	--	NR
1490-5	1.0-1.5	0	NR	--	NR
	2.5-3.0	0	NR	--	NR
1490-6	1.0-1.5	0	NR	--	NR
	2.0-2.5	0	NR	--	NR
1490-7	1.0-1.5	0	NR	--	NR
	2.0-2.5	0	NR	--	NR
1490-8	1.0-1.5	0	NR	--	NR
	2.5-3.0	0.2	NR	--	NR
1490-9	NR	NR	NR	--	NR
1490-10	1.0-1.5	0.1	NR	--	NR
	2.5-3.0	0	NR	--	NR
1490-11	1.5-2.0	0.2	NR	--	NR
	3.0-3.5	0	NR	--	NR
1490-12	1.0-1.5	0	NR	--	NR
	2.5-3.0	0.1	NR	--	NR
MAY-1490-1	1.0-1.5	1.0	NR	--	NR
	3.5-4.0	0.8	NR	--	NR
MAY-1490-2	1.0-1.5	0	NR	--	NR
MAY-1490-3	1.0-1.5	0	NR	--	NR
	3.5-4.0	0.2	NR	--	NR
MAY-1490-4	1.5-2.0	0	NR	--	NR
	3.5-4.0	0	NR	--	NR
MAY-1490-5	NR	NR	NR	--	NR

Notes:
- All units in parts per million (ppm)
- NR = Not Recorded
- OVA = Organic Vapor Analyzer (Century OVA-128)
- (*) = Difference between OVA reading without carbon filter and OVA reading with carbon filter
- PID = Photo-ionizing Device (Thermo-Envvironmental OVM or Photo-vac Micro-tip)

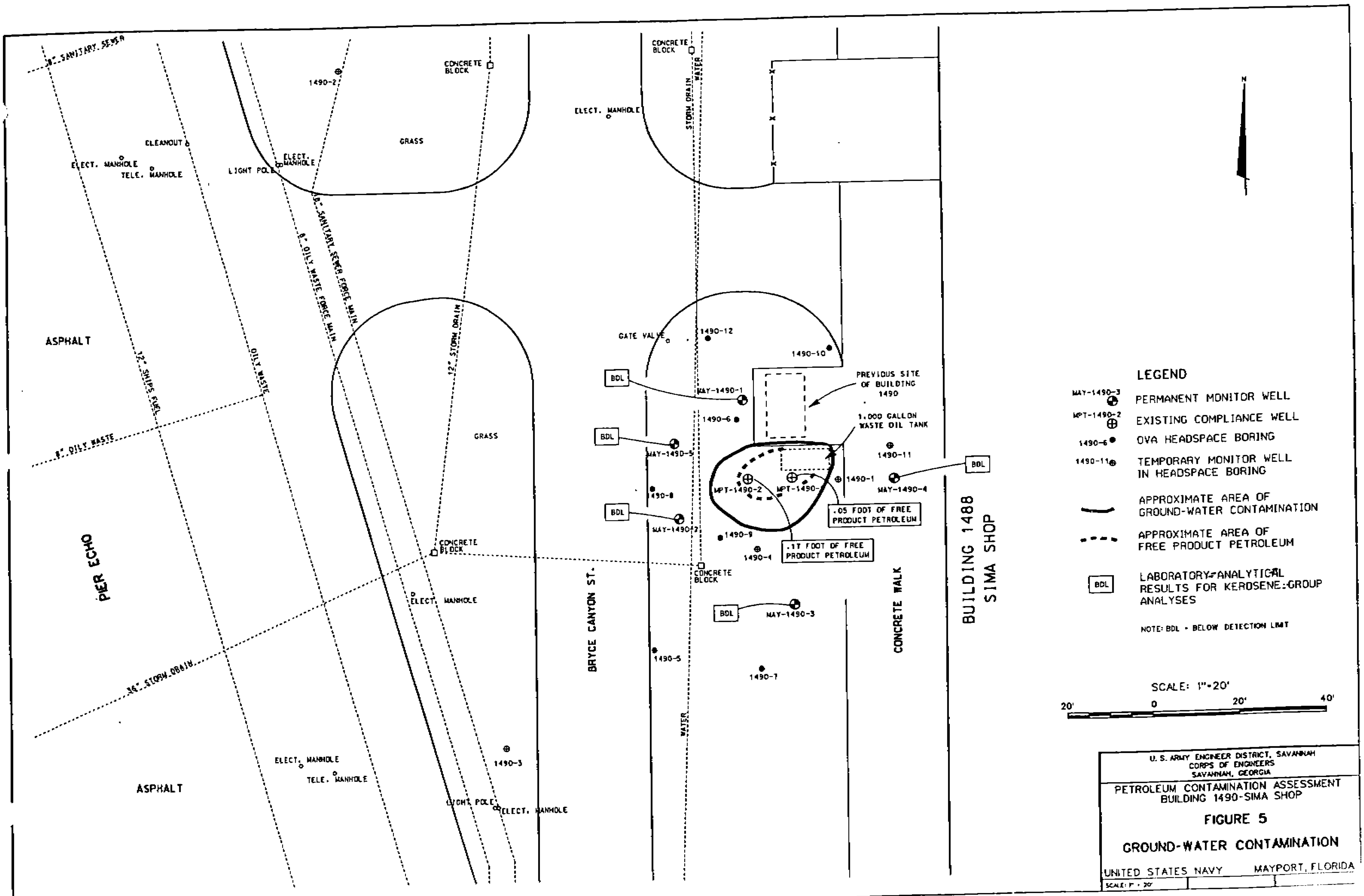

LEGEND
MAY-1490-3 PERMANENT MONITOR WELL
MPT-1490-2 EXISTING COMPLIANCE WELL
1490-6 OVA HEADSPACE BORING
1490-11 TEMPORARY MONITOR WELL IN HEADSPACE BORING
APPROXIMATE AREA OF GROUND-WATER CONTAMINATION
APPROXIMATE AREA OF FREE PRODUCT PETROLEUM
BDL LABORATORY-ANALYTICAL RESULTS FOR KEROSENE-GROUP ANALYSES
NOTE: BDL = BELOW DETECTION LIMIT
SCALE: 1"=20'
20' 0 20' 40'
BUILDING 1488 SIMA SHOP
CONCRETE WALK
BRYCE CANYON ST.
PIER ECHO
ASPHALT
GRASS
PREVIOUS SITE OF BUILDING 1490
1,000 GALLON WASTE OIL TANK
.05 FOOT OF FREE PRODUCT PETROLEUM
.1T FOOT OF FREE PRODUCT PETROLEUM
MAY-1490-1
MAY-1490-2
MAY-1490-3
MAY-1490-4
MAY-1490-5
MPT-1490-1
MPT-1490-2
1490-1
1490-2
1490-3
1490-4
1490-5
1490-6
1490-7
1490-8
1490-9
1490-10
1490-11
1490-12
BDL
GATE VALVE
CONCRETE BLOCK
ELECT. MANHOLE
TELE. MANHOLE
LIGHT POLE
CLEANOUT
STORM DRAIN
WATER
12" STORM DRAIN
36" STORM DRAIN
8" SANITARY SEWER
8" SANITARY SEWER FORCE MAIN
8" OILY WASTE FORCE MAIN
8" OILY WASTE
OILY WASTE
12" SHIPS FUEL
N
U. S. ARMY ENGINEER DISTRICT, SAVANNAH
CORPS OF ENGINEERS
SAVANNAH, GEORGIA
PETROLEUM CONTAMINATION ASSESSMENT
BUILDING 1490-SIMA SHOP
FIGURE 5
GROUND-WATER CONTAMINATION
UNITED STATES NAVY MAYPORT, FLORIDA

TABLE 3

SUMMARY OF GROUND-WATER ANALYTICAL RESULTS

BUILDING 1490
MAYPORT NAVAL STATION
MAYPORT, FLORIDA

11 JANUARY 1992

MONITOR WELL NUMBER

PARAMETER	MAY 1490-1	MAY 1490-2	MAY 1490-3	MAY 1490-3 DUPLICATE	MAY 1490-4	MAY 1490-5	MAY 1490 (MW-2) *	RINSATE BLANK	TRIP BLANK	Regulatory Standard
Purgeable Halocarbons (601/8010)										
Bromodichloromethane, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Bromoform, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Bromoethane, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Carbon Tetrachloride, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Chlorobenzene, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Chloroethane, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
2-Chloroethylvinyl Ether, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Chloroform, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Chloromethane, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Dibromochloromethane, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
1,2-Dichlorobenzene, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
1,3-Dichlorobenzene, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
1,4-Dichlorobenzene, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Dichlorodifluoromethane, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
1,1-Dichloroethane, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
1,2-Dichloroethane, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	3
1,1-Dichloroethene, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
cis/trans-1,2-Dichloroethylene, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
1,2-Dichloropropane, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Cis-1,3-Dichloropropene, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Trans-1,3-Dichloropropene, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Methyline Chloride, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
1,1,2,2-Tetrachloroethane, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Tetrachloroethene, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
1,1,1-Trichloroethane, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
1,1,2-Trichloroethane, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Trichloroethene, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Trichlorofluoromethane, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	

5/6/92 - CHEM1.XLS

TABLE 3

SUMMARY OF GROUND-WATER ANALYTICAL RESULTS

BUILDING 1490
MAYPORT NAVAL STATION
MAYPORT, FLORIDA

11 JANUARY 1992

MONITOR WELL NUMBER

PARAMETER	MAY 1490-1	MAY 1490-2	MAY 1490-3	MAY 1490-3 DUPLICATE	MAY 1490-4	MAY 1490-5	MAY 1490 (MW-2) *	RINSATE BLANK	TRIP BLANK	Regulatory Standard
Vinyl Chloride, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Purgeable Aromatics (602/8020)										
Benzene, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	1
Ethylbenzene, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Toluene, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Xylenes, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Methyl-Tert-Butyl-Ether (MTBE), ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	50
Total Volatile Organic Aromatics, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	50
1,2-Dibromoethane (EDB), ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	0.02
Lead, mg/l	0.017	0.012	0.005	0.012	0.007	BDL	BDL	BDL	BDL	0.05
Polynuclear Aromatic Hydrocarbons (8100)										
Acenaphthene, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Acenaphthylene, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Benzo (a) pyrene, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Benzo (g,h,i) perylene, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Benzo (b,k) fluoranthene, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Chrysene + Benzo (a) anthracene, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Fluoranthene, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Fluorene, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Indeno (1,2,3-cd) pyrene+Dibenzo (a,h) anthracene, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Naphthalene, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Phenanthrene, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Pyrene, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
2-Methylnaphthalene, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
1-Methylnaphthalene, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	
Total Naphthalenes, ug/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	

5/6/92 - CHEM1.XLS

TABLE 3

SUMMARY OF GROUND-WATER ANALYTICAL RESULTS

BUILDING 1490
MAYPORT NAVAL STATION
MAYPORT, FLORIDA

11 JANUARY 1992

MONITOR WELL NUMBER

PARAMETER	MAY 1490-1	MAY 1490-2	MAY 1490-3	MAY 1490-3 DUPLICATE	MAY 1490-4	MAY 1490-5	MAY 1490 (MW-2) *	RINSATE BLANK	TRIP BLANK	Regulatory Standard
Petroleum Hydrocarbons (418 1), mg/l	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	5
Total Dissolved Solids, mg/l	NA	NA	NA	NA	NA	NA	NA	NA	NA	
Chloride (325 2), mg/l	NA	NA	NA	NA	NA	NA	NA	NA	NA	

Notes: - BDL = Below Detection Limit
- NA = Not Analyzed
- * Existing compliance monitoring well - shown as MPT-1490-2 on drawings and MAY-1490-MW-2 in lab analytical results.

5.3 Ground-water Hydraulic Conductivity Testing Results

The results of slug test analyses indicate an average shallow subsurface horizontal hydraulic conductivity of 14.3 ft/day. The hydraulic gradient at the site was determined to be 0.009 ft/ft. The average pore water velocity (V) was calculated to be 0.43 ft/day. Transmissivity (T) was calculated to be 107.3 ft²/day. Slug test data, as well as equations and calculations used to determine these values, are contained in appendix D.

5.4 Tidal Influence Monitoring

The effect of tidal fluctuation in the nearby ship basin (St. Johns River) on the water level in monitor wells MAY-1490-1 and MAY-1490-5 was measured over a 24-hour period. The maximum change in water level in either of the wells was less than 0.23 foot. This minor fluctuation does not appear to significantly affect the ground-water flow direction.

5.5 Potable Water Well Survey

Mayport Naval Station presently provides all of its own potable water. Raw water supply is obtained from two 12-inch and two 16-inch diameter wells located on the station which draw water from the Floridan aquifer at depths that range from approximately 400 to 1,000 feet. Individual well capacities range between 2.1 and 2.9 MGD with a combined total capacity of 10.0 MGD and an effective capacity of 7.1 MGD.

Since all of the area within a ½-mile radius of the Building 1490 site is within the Naval Station boundary, a potable water well survey of the area was conducted using data supplied by the Mayport Naval Station Public Works Department, as well as data supplied by the City of Jacksonville Department of Health, Welfare, and Bio-Environmental Services. All known potable wells on the Naval Station were researched for applicable information and are included in table 4. The locations of these wells are shown on figure 6, which indicates that all four of the Naval Station water supply wells are within ½-mile of the Building 1490 site. The closest of these wells to the site is well no. 3, which is approximately 700 feet to the southeast; however, well no. 3 is up-gradient from the site. Well no. 1 is approximately 1,200 feet to the southwest, and wells 2 and 4 are approximately 2,300 feet to the northwest and 2,200 to the southwest, respectively. The fact that these wells are cased to depths over 400 feet, and are some distance away from the site, should preclude any effects on them from the shallow contaminants at the Building 1490 site.

TABLE 4

FIELD WATER QUALITY PARAMETERS

BUILDING 1490
MAYPORT NAVAL STATION
MAYPORT, FLORIDA

11 JANUARY 1992

Well No.	pH	Specific Conductance (umhos/cm)	Temperature (Degrees Celsius)
MAY-1490-1	6.94	748	18.0
MAY-1490-2	6.74	610	17.8
MAY-1490-3	6.75	820	16.7
MAY-1490-4	6.56	984	18.9
MAY-1490-5	6.80	650	18.4
MAY-1490-MW-2 *	6.86	747	19.0

* Existing compliance monitoring well - shown as MPT-1490-2 on drawings and MAY-1490-MW-2 in lab analytical results.

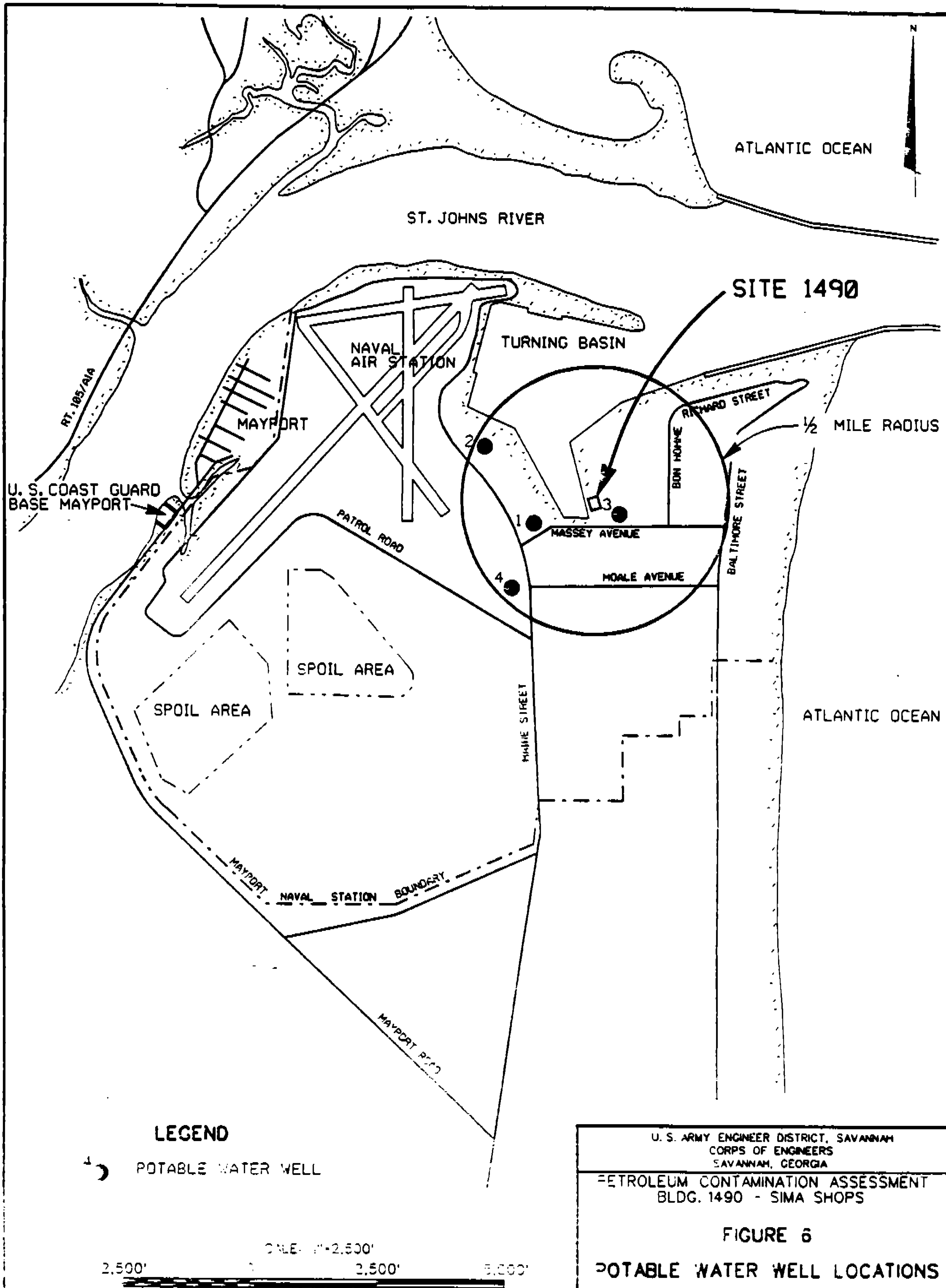
5/7/92
watqual.thl

TABLE 5

POTABLE WATER WELL SURVEY

BLDG. 1490
MAYPORT NAVAL STATION
MAYPORT, FLORIDA

Well No.	Usage	Total Depth (feet)	Casing Depth (feet)	Notes
1	Potable	1000	435	Completed 10/06/61
2	Potable	1000	435	Completed 04/03/58
3	Potable	1000	433	Completed 07/20/79
4	Potable	500	419	Completed 05/29/79



U. S. ARMY ENGINEER DISTRICT, SAVANNAH
CORPS OF ENGINEERS
SAVANNAH, GEORGIA

PETROLEUM CONTAMINATION ASSESSMENT
BLDG. 1490 - SIMA SHOPS

FIGURE 6

POTABLE WATER WELL LOCATIONS

UNITED STATES NAVY — MAYPORT, FLORIDA

SCALE: 1"=2,500'

6.0 SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

6.1 Summary

The following is a summary of site conditions based on the results of field and laboratory investigations made during contamination assessment:

1. Three water bearing zones apparently exist beneath the site. These consist of a surficial aquifer, a shallow rock aquifer, and the deeper Floridan aquifer. The surficial aquifer in the Mayport area is classified as a Class G-II ground-water source.

2. Soil borings indicate the sediments beneath the site consist generally of unconsolidated, brown, tan and gray, fine grained sands and silty sands, with occasional shell fragments, to an approximate depth of 30 feet below land surface (bls). No confining units were encountered during drilling activities at the site.

3. Ground water at the site was encountered at a depth of approximately 2.5 to 4.5 feet bls. The direction of flow in the surficial aquifer appears to be generally to the west-southwest. Tidal effects on the site do not appear to significantly change the ground-water flow direction.

4. Free product petroleum was found in two existing compliance monitoring wells near the underground storage tank during contamination assessment at the site. The maximum thickness of product measured in the wells was approximately 0.17 foot.

5. Priority pollutant analysis of ground water from one of the existing compliance wells found that arsenic, at a concentration of .028 ppm, was the only identified compound above detection limit. This concentration of arsenic is below the USEPA and Florida drinking water standard of .050 ppb. Ten unknown organic compounds were also indicated in this analysis, at concentrations ranging from 4 to 13 ppb.

6. Lead was the only Florida Kerosene Group contaminant found above detection limits in any of the monitor wells installed during contamination assessment. Total lead concentrations ranged from .005 to .017 ppm, which is below the regulatory standard of .05 ppm.

7. The vertical extent of contamination, as defined by the deep well, does not exceed 18 feet bls.

8. The calculated hydraulic conductivity in the surficial aquifer is 14.3 ft/day.

9. The average hydraulic gradient is approximately .009 ft/ft.

10. Four potable water supply wells located on the Naval Station are within ½-mile of the site. The closest of these wells, down-gradient from site, is approximately 1,200 feet away; however, all of these wells are cased to a depth of 400 feet or more, where they draw from the Floridan aquifer.

6.2 Conclusions

1. OVA headspace analyses at the site indicate that soil contamination is located predominantly within the tank backfill and soil immediately adjacent to the backfill.

2. The configuration of the ground-water contamination suggests that the contaminant plume is approximately 20 by 30 feet in area, and is moving generally down-gradient to the west-southwest, away from the source area.

3. Information obtained from the Naval Station Public Works Department, SIMA Shop personnel, as well as field observations during contamination assessment, indicate that the petroleum contamination at the site is due to a cumulative effect of past piping leaks, and spills resulting from periodic removal of the tank contents.

6.3 Recommendations

Although the extent of contamination of soil and ground water at the site is limited to a small area around the underground storage tank, the presence of free product petroleum in monitoring wells requires that a Remedial Action Plan be prepared to address the contamination.

7.0 PROFESSIONAL REVIEW

The contamination assessment contained in this report was prepared by an employee of the U.S. Army Corps of Engineers, Savannah District. who is a registered Professional Geologist in the state of Florida. Current Corps of Engineers policy does not support the signing and sealing of documents for work performed on projects for the Federal Government by its registered professional employees. This Contamination Assessment Report was prepared for the Naval Facilities Engineering Command , Building 1490 site at Mayport Naval Station, Mayport, Florida.

H. Cardwell Smith
Professional Geologist
P.G. No. 748

REC'D 9/29

ADDENDUM 1
TO
CONTAMINATION ASSESSMENT REPORT

MAYPORT NAVAL STATION
BUILDING 1490 - SIMA SHOPS

MAYPORT, FLORIDA

PREPARED FOR

UNITED STATES NAVY
SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CHARLESTON, SOUTH CAROLINA

PREPARED BY

U.S. ARMY CORPS OF ENGINEERS
SAVANNAH DISTRICT
SAVANNAH, GEORGIA

SEPTEMBER 1993

BACKGROUND

This addendum to the Contamination Assessment Report (CAR) for Building 1490 (adjacent to SIMA Building) at Mayport Naval Air Station, Mayport, Florida is a result of a request from the Florida Department of Environmental Regulation (FDER) to perform supplemental assessment work at the site. A copy of the FDER request and comments based on their review of the CAR can be found in attachment 1.

RESULTS OF SUPPLEMENTAL ASSESSMENT

The following findings of supplemental assessment at the site follow the numbered FDER comments shown in attachment 1.

1. Environmental compliance personnel at Mayport Naval Air Station implemented a program in February 1993 to measure and recover any free product, if needed, at the Building 1490 waste oil storage tank site. Although no free product has been observed in the monitoring wells during the monthly monitoring program, a minor amount of product (0.06 feet) was detected in well MPT-1490-1 at the time of the latest sampling event on 24 June 1993. The scheduled monthly monitoring check performed several days after the sampling event, found no accumulated product in the well. Subsequent monitoring of wells on the site has detected no additional accumulations of product.

2. To further define the horizontal and vertical extent of any potential ground-water contamination in the downgradient direction, an intermediate, supplemental, assessment well (MAY-1490-6) was installed near well MAY-1490-2 (see attachment 2). Well MAY-1490-6 was installed with the screen set between 17.0 and 22.0 feet below land surface (see well log in attachment 3).

Upon review of the original CAR dated May 1992, it appears the well log for intermediate, assessment well MAY-1490-5 may have been inadvertently, omitted. This well was also screened between 17.0 and 22.0 feet below land surface. The log of this well can also be found in attachment 3.

3. After the installation of supplemental assessment well MAY-1490-6, the ground water within this well and six other wells was sampled and analyzed for Xylenes, MTBE, and EPA Method 608, 624, and 625 compounds (see table 3-A, attachment 4). Due to the presence of free product (0.06 feet) in compliance well MPT-1490-1, no ground-water sample was collected for analysis during the most recent sampling event (24 June 93).

As summarized in Table 3-A, from the laboratory report provided in attachment 5, all of the chemicals analyzed from the most recent sampling event were reported as below detection limit (BDL) or less than the practical quantitation limit (PQL).

SUMMARY OF SUPPLEMENTAL ASSESSMENT

In comparing the results of the previous sampling event (11 January 92) for EDB, TRPH, MTBE, Lead, Xylenes, and EPA Method 601, 602, and 610 compounds to the results of the most recent sampling event on 24 June 1993 for MTBE, Xylenes, and EPA Method 608, 624, and 625 compounds, the extent of free product and ground-water contamination appears to be confined to the area adjacent to and slightly downgradient of the waste oil tank, just south of former Building 1490 (attachment 2).

LIST OF ATTACHMENTS

- ATTACHMENT 1 - FDER COMMENTS AND REQUEST FOR SUPPLEMENTAL ASSESSMENT
- ATTACHMENT 2 - SUPPLEMENTAL EXECUTIVE SUMMARY MAP
- ATTACHMENT 3 - MONITORING WELL LOGS
- ATTACHMENT 4 - TABLE 3-A, SUMMARY OF GROUND-WATER ANALYTICAL RESULTS
- ATTACHMENT 5 - SUPPLEMENTAL LABORATORY ANALYTICAL DATA

ATTACHMENT 1

FDER COMMENTS AND REQUEST FOR SUPPLEMENTAL ASSESSMENT

Florida Department of Environmental Regulation

Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400
Lawton Chiles, Governor
Carol M. Browner, Secretary

December 14, 1992
Rec 22 Dec CAL

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Mr. Carl Loop
Code 18237
Department of the Navy
Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
Post Office Box 10068
Charleston, South Carolina 26411

Dear Mr. Loop:

Department personnel have completed the technical review of the Contamination Assessment Report for Building 1490-SIMA shop, NS Mayport. I have enclosed a memorandum addressed to me from Mr. Jorge Caspary. It documents our comments on the referenced report.

If I can be of any further assistance with this matter, please contact me at 904/488-0190.

Sincerely,
Eric S. Nuzie
Eric S. Nuzie
Federal Facilities Coordinator

ESN/bb

Enclosure

cc: Jorge Caspary
Brian Cheary
Lynn Griffin
John Mitchell
Jerry Young
James Hudson
Cheryl Mitchell

For Routing To Other Than The Addressee	
To:	Location:
To:	Location:
To:	Location:
From:	Date:

State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

Interoffice Memorandum

TO: Eric S. Nuzie, Federal Facilities Coordinator
Bureau of Waste Cleanup

THROUGH: Dr. James J. Crane, ~~PGIII/Administrator~~ JJC
Technical Review Section

FROM: Jorge R. Caspary, PGI/Base Coordinator J.R.C.
Technical Review Section

DATE: December 1, 1992

SUBJECT: Review of Contamination Assessment Report for Building 1490-SIMA Shop. Mayport Naval Air Station.

I have reviewed the above referenced Contamination Assessment Report (CAR) dated May, 1992 (received May 22, 1992), submitted for this site. In order to meet the requirements of Chapter 17-770, Florida Administrative Code (F.A.C.), the following comments need to be addressed:

Please include an update of the recovery efforts conducted in accordance with Rule 17-770.300(1), F.A.C., particularly on free product thicknesses measured and volumes recovered to date.

Due to the undefined vertical extent of groundwater contamination, an intermediate depth monitoring well (screened from 17 to 22 feet below land surface) should be installed approximately 15 feet southwest of MPT-1490-2 to define the horizontal and vertical extent of the groundwater contamination in the downgradient direction.

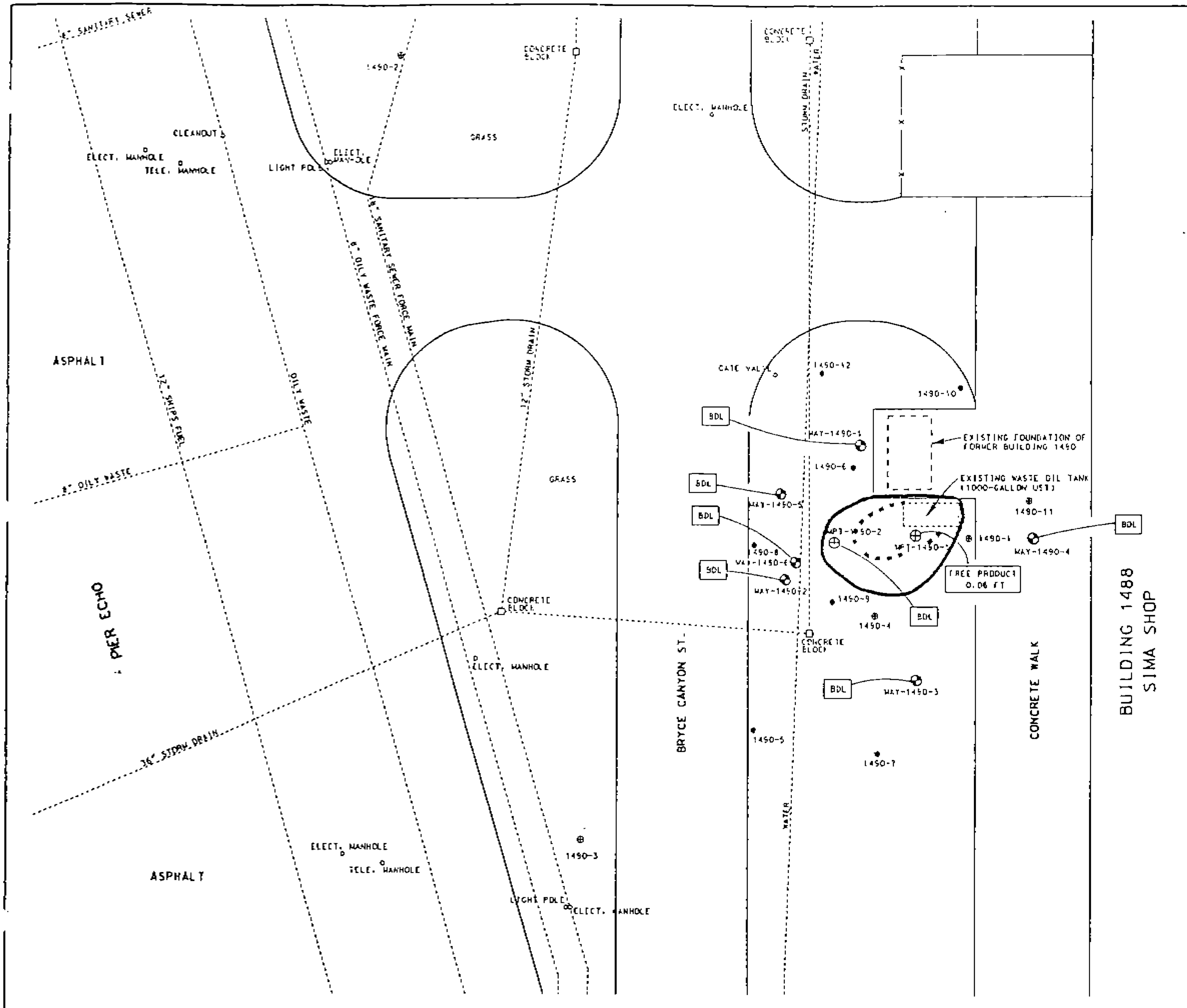
Following installation of the supplemental monitoring well, a complete round of sampling and analysis for EPA Methods 624 (including MTBE) and 625 should be performed (including compliance monitoring wells), so that this review can be completed and a Remedial Action Plan (RAP) can be prepared based on current data. Note, additional monitoring wells should be installed if significant contaminant concentrations are detected at perimeter monitoring wells of any affected stratum or at the vertical extent well.

Eric S. Nuzie
December 1, 1992
Page Two

The Navy should provide the results of the supplemental assessment to this section within sixty (60) days of receipt of this request. If additional time is needed, a time extension request should be submitted, in accordance with the Navy's Petroleum Contamination Agreement Site Management Plan. If there are any questions concerning this review, please contact Jorge R. Caspary at (904) 488-0190

ATTACHMENT 2

SUPPLEMENTAL EXECUTIVE SUMMARY MAP



LEGEND

- MAY-1490-3 PERMANENT MONITOR WELL
- MPT-1450-2 EXISTING COMPLIANCE WELL
- 1490-6 OVA HEADSPACE BORING
- 1490-11 TEMPORARY MONITOR WELL IN HEADSPACE BORING
- APPROXIMATE AERIAL EXTENT OF GROUND-WATER CONTAMINATION
- APPROXIMATE AERIAL EXTENT OF FREE PRODUCT PETROLEUM
- BDL BELOW DETECTION LIMIT DEFINED FOR ALL COMPOUNDS ANALYZED FROM GROUND-WATER SAMPLES.

NOTE: GROUND-WATER ANALYTICAL RESULTS FROM SAMPLING EVENT ON 24 JUNE 1993. SAMPLES ANALYZED FOR MTBE, XYLENES, AND EPA METHOD 608, 624 AND 625 COMPOUNDS.

SCALE: 1"=20'

20' 0 20' 40'

U. S. ARMY ENGINEER DISTRICT, SAVANNAH
CORPS OF ENGINEERS
SAVANNAH, GEORGIA

PETROLEUM CONTAMINATION ASSESSMENT
BUILDING 1490-SIMA SHOP

EXECUTIVE SUMMARY MAP
(SUPPLEMENTAL)
CONTAMINATION OF GROUND WATER

UNITED STATES NAVY — MAYPORT, FLORIDA

SCALE: 1" = 20' | REVISED 1/22/93

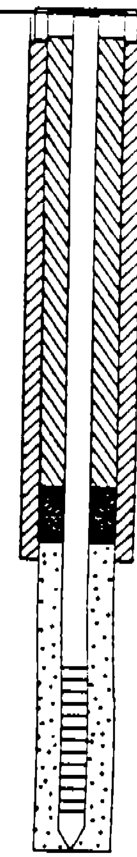
ATTACHMENT 3

MONITORING WELL LOGS

SOUTHERN DIVISION NAVAL FACILITIES ENGINEERING COMMAND
GROUNDWATER MONITORING WELL INSTALLATION REPORT

TITLE: Mayport Naval Station Bldg. 1490, SIMA Shops		LOG of WELL: MAY-1490-5	BORING NO.
CLIENT: SOUTHNAVFACENGCOM			PROJECT NO:
CONTRACTOR: USACE - Sav. District		DATE STARTED: 24 APR 91	COMPL TD: 24 APR 91
METHOD: 7" O.D.	CASE SIZE: 2" PVC	SCREEN INT.: 17.9' to 21.9'	PROTECTION LEVEL: D
TOC ELEV.: 7.06'	MONITOR INST.: OVA	TOT. DEPTH: 23.0'	DEPTH TO ▽ 3.5'
LOGGED BY: M. FIFE	WELL DEVELOPMENT DATE: 24 APR 91		SITE: Bld. 1490

DEPTH FT.	LABORATORY SAMPLE ID.	SAMPLE	RECOVERY	HEADSPACE (ppm)	SOIL/ROCK DESCRIPTION	LITHOLOGIC SYMBOL	SOIL CLASS	BLOWS/6-IN	WELL DATA
					(SM) Brown, fine grained, silty sand.		SM		
					Saturated, with some shell fragments.				
5									
					Gravel.				
10									
					(SP) Tan, fine grained, poorly graded sand.		SP		
					Brown and tan.				
15					Light tan and gray.				
					Light gray, very fine grained.				
					Fine grained.				
20									
25									
30									
35									
40									



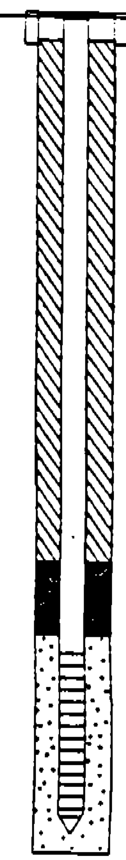
NOTE: SOILS VISUALLY FIELD CLASSIFIED IN ACCORDANCE WITH THE UNIFIED SOIL CLASSIFICATION SYSTEM.

DRILLED TO 15.0' WITH 12" FISHTAIL BIT. SET 8". PVC OUTER SURFACE CASING TO 15'. GROUTED ANNULAR SPACE WITH CEMENT. INNER 2" PVC SCREEN AND RISER TELESCOPED THROUGH TO DEPTH.

SOUTHERN DIVISION NAVAL FACILITIES ENGINEERING COMMAND
GROUNDWATER MONITORING WELL INSTALLATION REPORT

TITLE: Mayport Naval Station Bldg. 1490, SIMA Shops		LOG of WELL: MAY-1490-6	BORING NO.
CLIENT: SOUTHNAVFACENGCOM			PROJECT NO:
CONTRACTOR: USACE - Sav. District		DATE STARTED: 4 FEB 93	COMPLTD: 4 FEB 93
METHOD: 7" O.D.	CASE SIZE: 2" PVC	SCREEN INT.: 17.0' to 22.0'	PROTECTION LEVEL: D
TOC ELEV.: 7.10'	MONITOR INST.: OVA	TOT. DEPTH: 22.5'	DEPTH TO ▽ 3.5'
LOGGED BY: M. FIFE	WELL DEVELOPMENT DATE:		SITE: Bld. 1490

DEPTH FT.	LABORATORY SAMPLE ID.	SAMPLE	RECOVERY	HEADSPACE (ppm)	SOIL/ROCK DESCRIPTION	LITHOLOGIC SYMBOL	SOIL CLASS	BLOWS/6-IN	WELL DATA
				0.0	(SM) Tan, fine, silty sand, no odor.		SM		
				0.0					
				0.2					
5					Brownish gray with shell fragments, no odor.				
10					Brown, no odor.				
				12.0				23	
15					(SP) Gray, fine, poorly graded sand, no odor.		SP		
				0.0				31	
20									
				1.7				60	
25									
30									
35									
40									



NOTE: SOILS VISUALLY FIELD CLASSIFIED IN ACCORDANCE WITH THE UNIFIED SOIL CLASSIFICATION SYSTEM.

HEADSPACE READINGS NOTED AS DIFFERENCE BETWEEN FILTERED AND UNFILTERED VALUES.

DRILLED TO 23.0' WITH 10.5" O. D. HSA. SET 2" PVC CASING AND SCREENED BETWEEN 17.0' AND 22.0' BLS. AFTER FILTER PACKED ABOVE SCREEN, SEALED WITH BENTONITE AND GROUTED WITH CEMENT TO SURFACE..

ATTACHMENT 4

TABLE 3-A, SUMMARY OF GROUND-WATER ANALYTICAL RESULTS

TABLE 3-A (SUPPLEMENTAL)

SUMMARY OF GROUND-WATER ANALYTICAL RESULTS

24 JUNE 93

MONITORING WELL MONTH-YEAR SAMPLED	MAY 1490-1-6-93	MAY 1490-2-6-93	MAY 1490-2-6-93 DUPLICATE	MAY 1490-3-6-93	MAY 1490-4-6-93	MAY 1490-5-6-93	MAY 1490-6-6-93	MPT 1490-2-6-93	MAY 1490-6-93 EQP BLANK	1490-6-93 TRIP BLANK
CHEMICAL NAME	PURGEABLES, EPA METHOD 624 VOLATILE ORGANICS									
Benzene *	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Bromodichloromethane *	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Bromoform *	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Bromoethane **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Carbon Tetrachloride *	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Chlorobenzene *	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Chloroethane **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
2-Chloroethylvinyl Ether #	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Chloroform *	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Chloromethane **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Dibromochloromethane *	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-Dichlorobenzene *	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,3-Dichlorobenzene *	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,4-Dichlorobenzene *	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1-Dichloroethane *	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-Dichloroethane *	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1-Dichloroethene *	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Trans-1,2-Dichloroethylene *	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Cis-1,2-Dichloroethylene *	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,2-Dichloropropane *	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Cis-1,3-Dichloropropene *	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Trans-1,3-Dichloropropene *	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Ethylbenzene *	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Methyline Chloride *	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1,2,2-Tetrachloroethane *	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Tetrachloroethene *	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Toluene *	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1,1-Trichloroethane *	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
1,1,2-Trichloroethane *	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Trichloroethene *	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Trichlorofluoromethane *	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
Vinyl Chloride **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL

Note: BDL - Below Detection Limit (ug/l), PQL - Practical Quantitation Limit (ug/l) - DL, * - DL 5, ** - DL 10, *** - DL 20, # - DL 50, ## - DL 500, ### - DL 2000, Ground-Water Samples Collected 6/24/93, Bldg 1490, Mayport Naval Station.

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TABLE 3-A (CONT.)

SUMMARY OF GROUND-WATER ANALYTICAL RESULTS

24 JUNE 93

MONITORING WELL MONTH-YEAR SAMPLED	MAY 1490-1-6-93	MAY 1490-2-6-93	MAY 1490-2-6-93 DUPLICATE	MAY 1490-3-6-93	MAY 1490-4-6-93	MAY 1490-5-6-93	MAY 1490-6-6-93	MPT 1490-2-6-93	MAY 1490-6-93 EQP BLANK	1490-6-93 TRIP BLANK
CHEMICAL NAME	BASE NUETRALS, EPA METHOD 625 SEMIVOLATILE ORGANICS									
Acenaphthene **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Acenaphthylene **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Anthracene **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Aldrin **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Benzo (a) Anthracene **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Benzo (b) fluoranthene **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Benzo (k) fluoranthene **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Benzo (a) pyrene **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Benzo (g,h,i) perylene **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Benzyl butyl phthalate **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
bis(2-Chloroethyl) ether **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
bis(2-Chloroethoxy) methane **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
bis(2-Ethylhexyl) phthalate **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
bis(2-Chloroisopropyl) ether **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
4-Bromophenyl-phenyl-ether **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
2-Chloronaphthalene **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
4-Chlorophenyl-phenyl ether **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Chrysene **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Dibenzo (a,h) anthracene **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Di-n-butylphthalate **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
1,3-Dichlorobenzene **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
1,2-Dichlorobenzene **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
1,4-Dichlorobenzene **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
3,3'-Dichlorobenzidine ***	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Diethyl phthalate **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Dimethyl phthalate **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
2,4-Dinitrotoluene **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A

Note: BDL - Below Detection Limit (ug/l), PQL - Practical Quantitation Limit (ug/l) - DL, * - DL 5, ** - DL 10, *** - DL 20, # - DL 50, ## - DL 500, ### - DL 2000, Ground-Water Samples Collected 6/24/93, Bldg 1490, Mayport Naval Station,
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TABLE 3-A (CONT.)

SUMMARY OF GROUND-WATER ANALYTICAL RESULTS

24 JUNE 93

MONITORING WELL MONTH-YEAR SAMPLED	MAY 1490-1-6-93	MAY 1490-2-6-93	MAY 1490-2-6-93 DUPLICATE	MAY 1490-3-6-93	MAY 1490-4-6-93	MAY 1490-5-6-93	MAY 1490-6-6-93	MPT 1490-2-6-93	MAY 1490-6-93 EQP BLANK	1490-6-93 TRIP BLANK
CHEMICAL NAME	BASE NUETRALS, EPA METHOD 625 SEMIVOLATILE ORGANICS (CONT.)									
2,6-Dinitrotoluene **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Di-n-octylphthalate **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Fluoranthene **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Fluorene **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Hexachlorobenzene **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Hexachlorobutadiene **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Hexachloroethane **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Indeno (1,2,3-cd) pyrene **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Isophorone **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Naphthalene **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Nitrobenzene **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
N-Nitrosodi-N-Propylamine **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Phenanthrene **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Pyrene **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
1,2,4-Trichlorobenzene **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
CHEMICAL NAME	ACID EXTRACTABLES, EPA METHOD 625 SEMIVOLATILE ORGANICS									
4-Chloro-3-methylphenol **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
2-Chlorophenol **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
2,4-Dichlorophenol **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
2,4-Dimethylphenol **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
2,4-Dinitrophenol #	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
2-Methyl-4,6-dinitrophenol **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
2-Nitrophenol **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
4-Nitrophenol #	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Pentachlorophenol #	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Phenol **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
2,4,6-Trichlorophenol **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A

Note: BDL - Below Detection Limit (ug/l), PQL - Practical Quantitation Limit (ug/l) - DL, * - DL 5, ** - DL 10, *** - DL 20, # - DL 50, ## - DL 500, ### - DL 2000, Ground-Water Samples Collected 6/24/93, Bldg 1490, Mayport Naval Station, MPLABADM.XLS

TABLE 3-A (CONT.)

SUMMARY OF GROUND-WATER ANALYTICAL RESULTS

24 JUNE 93

MONITORING WELL MONTH-YEAR SAMPLED	MAY 1490-1-6-93	MAY 1490-2-6-93	MAY 1490-2-6-93 DUPLICATE	MAY 1490-3-6-93	MAY 1490-4-6-93	MAY 1490-5-6-93	MAY 1490-6-6-93	MPT 1490-2-6-93	MAY 1490-6-93 EQP BLANK	1490-6-93 TRIP BLANK
CHEMICAL NAME	XYLENES, MTBE, "TOXAPHENE, ORGANOCHLORINE PESTICIDES, & PCBs, EPA METHOD 608 SEMIVOLATILE ORGANICS"									
Xylenes *	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Methyl-Tert-Butyl-Ether (MTBE) *	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Toxaphene ###	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
beta-BHC **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
delta-BHC **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Chlordane #	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
4,4'-DDD **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
4,4'-DDE **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
4,4'-DDT **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Dieldrin **	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Endosulfan sulfate ***	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Endrin aldehyde #	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Heptachlor ***	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Heptachlor epoxide ***	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Aroclor-1016 ##	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Aroclor-1221 ##	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Aroclor-1232 ##	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Aroclor-1242 ##	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Aroclor-1248 ##	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Aroclor-1254 ##	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A
Aroclor-1260 ##	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	N/A

Note: BDL - Below Detection Limit (ug/l), PQL - Practical Quantitation Limit (ug/l) - DL, * - DL 5, ** - DL 10, *** - DL 20, # - DL 50, ## - DL 500, ### - DL 2000, Ground-Water Samples Collected 6/24/93, Bldg 1490, Mayport Naval Station,
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ATTACHMENT 5

SUPPLEMENTAL LABORATORY ANALYTICAL DATA

orida Department of
Environmental Protection

Memorandum

TO:	Eric S. Nuzie,	Federal Facilities Coordinator Bureau of Waste Cleanup
THROUGH:	James J. Crane,	P.G. III Administrator Technical Review Section JJC
	Tim J. Bahr,	Professional Geologist II Technical Review Section TB
FROM:	David M. Clowes,	Remedial Project Manager Technical Review Section DMC
DATE:	December 14, 1993	
SUBJECT:	Contamination Assessment Report (CAR) Addendum 1 for Building 1490 - SIMA Shops, Naval Station Mayport.	

I have reviewed the Contamination Assessment Report (CAR) Addendum 1 dated September 1993 (received October 18, 1993), submitted for this site.

All the documents submitted to date are adequate to meet the contamination assessment requirements of Rules 17-770.600 and 17-770.630, Florida Administrative Code (F.A.C.). However, free product recovery should be implemented in accordance with Rule 17-770.300(1), F.A.C.

SAMPLED,

HASN'T BEEN SAMPLED.

When all free product has been removed, then monitoring wells (MPT-1490-1 and MPT-1490-2) that have contained free product should be resampled (EPA Methods 608, 624, and 625) to determine if a Remedial Action Plan (RAP) is necessary. If laboratory analyses of these wells confirm that contaminant concentrations are below the target cleanup levels for the constituents of concern, then a RAP is not necessary.

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DEPARTMENT OF THE ARMY

SAVANNAH DISTRICT, CORPS OF ENGINEERS
P.O. BOX 889
SAVANNAH, GEORGIA 31402-0889

REPLY TO
ATTENTION OF:

CESAS-EN

10 March 1994

MEMORANDUM FOR Commanding Officer, Southern Division, Naval Facilities Engineering Command, Code 1842, 2155 Eagle Dr., P.O. Box 190010, Charleston, SC 29419-9010

SUBJECT: Addendum 1 to Contamination Assessment Report (CAR), Mayport Naval Station, Building 1490, SIMA Shops

1. The following response is provided for Florida Department of Environmental Protection (FDEP) comments on the subject report dated December 14, 1993. A copy of the FDEP comments is also attached.

   a. The continuing monthly monitoring program has found no free product in site monitoring wells MPT-1490-1 and MPT-1490-2 since September of 1993.

   b. Since no free product has been observed, wells MPT-1490-1 and MPT-1490-2 will be re-sampled for EPA methods 608, 624 and 625 to determine if a RAP is necessary for the site.

   c. A contract to remove and replace the underground tank at the site is also being initiated. Any excessively contaminated soil found in the backfill around the tank during tank removal, will be removed and properly disposed of. Findings of the tank removal will be addressed in the required Closure Report.

2. If you have any questions or comments, please contact Cardwell Smith at 912-652-5674.

FOR THE COMMANDER:

JHRogers

JOSEPH H. ROGERS, JR., P.E.
Chief, Engineering Division

Encl

Post-it™ brand fax transmittal memo 7671

# of pages ▸ 1	
To Cheryl Mitchel	From Bryan Kizer
Co.	Co.
Dept.	Phone #
Fax # 960-6884	Fax #

TOTAL P.01

morandum

Florida Department of
Environmental Protection

TO: Eric S. Nuzie, Federal Facilities Coordinator
Bureau of Waste Cleanup

THROUGH: James J. Crane, P.G. Administrator
Technical Review Section JJC

Tim J. Bahr, Professional Geologist II TB
Technical Review Section

FROM: David M. Clowes, Remedial Project Manager DMC
Technical Review Section

DATE: April 23, 1994

SUBJECT: Response to Comments on Contamination Assessment Report (CAR) Addendum 1 for Building 1490 - SIMA Shops, Naval Station Mayport.

I have reviewed the above document dated March 21, 1994 (received March 29, 1994), submitted for this site. The document appears acceptable.

A CAR Addendum 2 should now be submitted with the results of resampled monitoring wells MPT-1490-1 and MPT-1490-2.

APPENDIX D
TECHNICAL MEMORANDA

Drilling and Subsurface Soil Sampling
Sediment and Surface Water Sampling
Surface Soil Samples
Decontamination Procedures
Groundwater Sampling

TECHNICAL MEMORANDUM

PREPARED BY: Gregory M. Brown

DATE: September 23, 1991

TITLE: DRILLING AND SUBSURFACE SOIL SAMPLING

PURPOSE: The purpose of this Technical Memorandum (TM) is to provide technical guidance and standard operating procedures for drilling and subsurface soiling sampling at Naval Station Mayport, Florida. This TM presents the methods for borehole construction and subsurface soil sampling using hollow-stem auger technique and split-spoon samplers, specific for conditions expected to be encountered at Naval Station Mayport during Resource Conservation and Recovery Act (RCRA) Facility Investigations (RFI).

SCOPE: This TM covers hollow-stem augering, split-spoon subsurface soil sampling, and field screening of soil samples. Standard operating procedures for related activities such as monitoring well installation are presented in the applicable Technical Memorandum.

Drilling. Drilling activities will be used to collect subsurface soil samples and to construct groundwater monitoring wells. Monitoring wells completed in the surficial deposits will be drilled with hollow-stem augers (HSA). Monitoring wells completed in the Upper Hawthorn Group will be drilled by a combination of HSA in the surficial deposits and rotary technique to the Upper Hawthorn. The Upper Hawthorn wells will be constructed with surface casings (double cased).

General groundwater monitoring well construction details specific to Naval Station Mayport are described in Section 3.2.3.1, Volume II, Sampling and Analysis Plan. Figures 3-3a through 3-3d of Volume II, Sampling and Analysis Plan, present typical monitoring well installation details. Well construction methods and materials are described in applicable Technical Memoranda (Well Construction and Development and "Southern Division Naval Facilities Engineering Command (SOUTHNAVFACENGCOM) Guidelines for Groundwater Monitoring Well Installation") located in the Site-Specific Quality Assurance Plan (QAP), Appendix B, Volume II, Sampling and Analysis Plan.

A truck-mounted drill rig with high torque capacity such as the Failing F-6 auger rig will be used to install the wells in the surficial deposits and the initial parts of the Upper Hawthorn monitoring wells. A rotary rig, such as a Speed Star™, will be used to drill the Upper Hawthorn wells below the depth of the surface casing (keyed into an upper confining unit) to their completion depth. Surface casings will be used for wells completed in the Upper Hawthorn to minimize cross contamination between water-bearing zones.

Auger cuttings will be collected and placed in containers until analytical data indicate the appropriate method of disposal for these materials as described in Section 2.1.6, Volume II, Sampling and Analysis Plan. Drilling fluids will also be containerized. Augers, rods, bits, mud pits, temporary surface casings, and other intrusive equipment will be decontaminated according to referenced standard operating procedures (Decontamination Procedures, Appendix B, Volume II).

Drilling activities will be documented through completion of boring logs. Bound field logbook(s) will also be kept to record data not recorded on the boring logs. Documentation will be completed in accordance with Section 3.1.8, Volume II, Sampling and Analysis Plan.

Subsurface Soil Sampling. Subsurface soil samples will be collected in the surficial deposits while drilling monitoring wells (refer to applicable sections in Volume II, Sampling and Analysis Plan, for boring and sampling locations at each site). Borings will be advanced by HSAs in the Surficial Deposit. Soil samples will be collected at 5-foot intervals using split-spoon samplers. Borings will be logged by a qualified geologist in accordance with the Unified Soil Classification System. Soil samples will be field screened using an organic vapor analyzer (OVA) or equivalent as described below.

Soil samples for laboratory chemical analysis will be collected from selected borings at just above groundwater level. Judgmental samples may be collected if visual inspection or field screening data from an OVA (or equivalent) indicates potential contamination. Depth to groundwater will vary from site to site, but is expected to be approximately 10 feet below surface, on average, over the facility.

Samples for physical parameters will be collected in the next adjacent sample interval (i.e., 5 feet below) after collection of the samples for laboratory analysis. The procedures for boring and collecting subsurface soil samples within the surficial deposit are described below.

1. Drilling and sampling equipment (e.g., split spoons) coming into contact with site soils will be decontaminated prior to sampling, between sampling locations, and at the completion of work using standard operating procedures.

2. Decontaminated equipment will be stored on clean, polyethylene sheeting or wrapped in aluminum foil or plastic bags between uses. Following decontamination, sampling equipment will not be allowed to touch the ground prior to use.

3. A truck-mounted drill rig will be used to advance the hollow-stem auger. The boring point will be located from the appropriate "Location of Exploration" figures in Volume II, Sampling and Analysis Plan. The area will be cleared for aboveground and subsurface utilities. The drilling equipment and exclusion zone will be set up as specified in the Health and Safety Plan.

4. The borings will be drilled through the surficial deposit using hollow-stem augers. The borings will be logged by a qualified geologist.

5. Background or HNU, OVA, or TIP readings will be obtained. Readings at the borehole and in the breathing zone will be obtained while drilling and collecting samples. OVA readings will be recorded in the field logbook.

6. Soil samples will be continuously collected using 2-inch O.D., 18-inch long, steel split-spoon samplers (Standard Penetration Test American Society for Testing and Materials (ASTM) D1586).

7. Samples at 5-foot intervals through the surficial deposit. Any disturbed material will be removed from the top of the sample interval. Sample containers will be filled by collecting soil material from the entire sample interval. For borings where samples are to be chemically analyzed, perform headspace field screening will be performed on a portion of the sample, as described below in the section titled Field Screening. OVA readings will be recorded in the field logbook.

8. The sample containers will be numbered and labeled as directed in Section 3.1.5, Volume II, Sampling and Analysis Plan.

9. Field documentation and chain-of-custody records will be completed for each sample selected for analysis, according to Section 3.1, Volume II, Sampling and Analysis Plan.

10. The outside of the sample containers will be decontaminated using the procedures in the Technical Memorandum, Decontamination Procedures, Appendix B, Volume II, Sampling and Analysis Plan.

11. The samples will be preserved according to Section 3.1.6, Volume II, Sampling and Analysis Plan.

12. The packaging and shipping protocol will be followed as described in Section 3.1.7, Volume II, Sampling and Analysis Plan.

<u>Field Screening</u>. The procedures described below will be followed to field screen subsurface soil samples.

1. The soil sample will be collected from a split-spoon sampler.

2. Approximately 100 to 200 cubic centimeters of the sample will be transferred to a sealable plastic bag using a clean stainless-steel spoon. The remaining portion of the sample will be sealed in appropriate sample containers and labeled according to Section 3.1.5, Volume II, Sampling and Analysis Plan.

3. The sample will be agitated in the bag in order to break up the soil matrix and maximize the surface area of soil that is in contact with the headspace.

4. The instrument probe of the HNU, OVA, or TIP will be inserted inside the bag and sealed around the opening as much as possible.

5. The concentration of organic vapors will be read after a pre-determined equilibrium period has elapsed (at least 30 seconds) or after the instrument read-out has stabilized.

6. The organic vapor concentration and gross physical characteristics of the sample (e.g., dry, wet, sandy, clayey, discolored) will be recorded. The original sample number will be recorded with this data so that sample selection for laboratory analyses can be made.

7. The headspace screening data will be reviewed after completion of subsurface soil sampling at each boring location, and one or more samples with elevated organic vapor levels will be selected for laboratory analyses.

8. Unselected samples will be disposed with the auger cuttings.

TECHNICAL MEMORANDUM

PREPARED BY: Gregory M. Brown

DATE: September 23, 1991

TITLE: SEDIMENT AND SURFACE WATER SAMPLING

PURPOSE: The purpose of this technical memorandum (TM) is to provide technical guidance and standard operating procedures for sediment and surface water sampling at Naval Station Mayport, Florida. This TM presents the sediment and surface water sampling methods specific for conditions expected to be encountered at Naval Station Mayport during RCRA Facility Investigations (RFI).

SCOPE: The scope of this TM covers sediment and surface water sampling methods for the RFI at Naval Station Mayport. Standard operating procedures for related activities are presented in other applicable Technical Memoranda.

Surface water and sediment samples will be taken from the drainage conveyance system at the site to assess its potential to accumulate and/or transport contamination from potential source locations. The data will also be used to assess potential risks to the environment.

Sediment Samples. Sediment samples should be collected under dry conditions, if possible, when standing water is absent. When conditions are dry, sediment sampling should follow the protocols described in the Technical Memorandum, Surface Soil Sampling, Appendix B, Volume II, Sampling and Analysis Plan, for collecting surface soil samples. If standing water is present at the sediment sampling location, surface water samples should be obtained prior to sediment sampling. Applicable health and safety procedures should be followed for work near open water. A "buddy" system shall be used. Sediment samples will be collected under wet conditions by the following procedures.

1. Sampling locations will be approached from downstream. Locations will be marked with survey stakes and tape. Sample location will be documented with a photograph.

2. Sampling equipment will be decontaminated prior to each sampling event using the procedures described in the Technical Memorandum, Decontamination Procedures, Appendix B, Volume II, Sampling and Analysis Plan.

3. Samples will be numbered and containers will be labeled as directed in Section 3.1, Volume II, Sampling and Analysis Plan.

4. The sediment sample will be collected with a decontaminated stainless-steel push tube (e.g., a Shelby tube). The sample will be collected by pushing the tube into the sediment to the desired depth. The tube will be worked to loosen the sample and the tube will be carefully removed without losing the sample. The sample

will be extruded from the tube with a new wooden dowel and placed into a clean glass jar with a Teflon™-lined lid.

5. If retrieval with a Shelby tube is unfeasible, the sample will be obtained using a Ponar Dredge. The dredge will be lowered slowly through the water column. Upon contact with the bottom sediments, a locking mechanism releases, which allows the dredge to close. The dredge will be returned to the surface, opened, and water captured in the top, slowly drained to minimize loss of fine particles that may be present. The dredge will be opened and the contents placed into clear sample jars with Teflon™-lined lids. The method of sampling will be documented.

6. The sampling activities performed at each location will be documented, including chain-of-custody forms, according to Section 3.1, Volume II, Sampling and Analysis Plan.

7. The outside of the sample containers will be decontaminated using the procedures in the Technical Memorandum, Decontamination Procedures, Appendix B, Volume II, Sampling and Analysis Plan.

8. The samples will be preserved according to Section 3.1, Volume II, Sampling and Analysis Plan.

9. Personnel will proceed to the next sampling location.

10. When all sediment samples are collected, containers will be packaged following the procedures in Section 3.1, Volume II, Sampling and Analysis Plan.

Surface Water Samples. Surface water samples should be collected before sediment samples if wet conditions exist. Applicable health and safety procedures should be followed for work near open water. Surface water samples will be collected using the procedures below.

1. The sampling locations will be approached from downstream. The locations will be marked with survey stakes and tape. The sample locations will be documented with a photograph.

2. Sampling equipment will be decontaminated prior to each sampling episode using the procedures described in the Technical Memorandum, Decontamination Procedures, Appendix B, Volume II, Sampling and Analysis Plan.

3. Samples will be numbered and containers will be labeled as directed in Section 3.1, Volume II, Sampling and Analysis Plan.

4. Surface water will be collected with a decontaminated wide-mouth glass jar, glass or stainless-steel beaker, or Kemmer™ sampler. The sample will be collected by inverting the container while entrapping air. The sample collection container will be submerge to a depth of approximately 1 foot. The sample collection container will be rotated quickly to expel the air and the water sample will be collected. The sample collection container will be removed quickly while avoiding collection of sediment. Then the sample collection

container will be closed until the analytical sample bottles are filled.

5. A second sample will be obtained in a clean container and the pH, temperature, and specific conductance will be measured in the field. The container will be thoroughly rinsed with deionized water between sampling locations.

6. The water sample will be poured from the sample collection container into clear analytical sample bottles. The samples will be preserved according to Section 3.1, Volume II, Sampling and Analysis Plan.

7. The sampling activities performed at each location will be documented including chain-of-custody forms, according to Section 3.1, Volume II, Sampling and Analysis Plan.

8. The outside of the sample containers will be decontaminated using the procedures in the Technical Memorandum, Decontamination Procedures, Appendix B, Volume II, Sampling and Analysis Plan.

9. Personnel will then proceed to the next sampling location.

10. When all surface water samples are collected, containers will be packaged following the procedures in Section 3.1, Volume II, Sampling and Analysis Plan.

TECHNICAL MEMORANDUM

PREPARED BY: Gregory M. Brown

DATE: September 23, 1991

TITLE: SURFACE SOIL SAMPLES

PURPOSE: The purpose of this Technical Memorandum (TM) is to provide technical guidance and standard operating procedures for surface soil sampling at Naval Station Mayport, Florida. This TM presents the surface soil sampling methods specific for conditions expected to be encountered at Naval Station Mayport during RCRA Facility Investigation (RFI).

SCOPE: The scope of this TM covers soil sampling methods for the RFI at Naval Station Mayport. Standard operating procedures for related activities are presented in other applicable Technical Memoranda.

The procedures described below described below shall be followed when collecting surface and shallow soil samples:

1. Sampling equipment coming into contact with soil samples will be decontaminated prior to sampling, between sampling locations, and at the completion of work using the procedures outlined in the Technical Memorandum, Decontamination Procedures, Appendix B, Volume II, Sampling and Analysis Plan.

2. Decontaminated equipment will be stored on clean polyethylene sheeting or wrapped in aluminum foil or plastic bags between uses. Following decontamination, the sampling equipment will not be allowed to touch the ground prior to use.

3. The samples will be numbered and containers will labelled as directed in Section 3.1, Volume II, Sampling and Analysis Plan.

4. The sample location will be located and marked with a surveyor's flag or equivalent.

5. Background HNU, OVA, or TIP readings will be obtained. Readings at soil surface and in breathing zone will be obtained while collecting samples. Organic vapor readings will be recorded in the field logbook.

6. Sticks, leaves, and other surface debris in vicinity of sampling location will be removed.

7. Surface and shallow soil samples will be collected using a soil hand auger.

8. Surface samples will be collected no deeper than 0 to 1 foot. Shallow surface samples will be collected by auguring through clean backfill, if present, to the interface with native soils. The sample will be collected at this interval. After retrieval, depth of hole will be measured with a clean, metal ruler or mark on the

auger. The sample will be placed in a clean glass jar and labeled. The sample will be preserve in accordance with Section 3.1, Volume II. Sampling and Analysis Plan.

9. The sampling locations will be photographed. The sample location will be measured relative to local reference landmarks and an entry into logbook.

10. Personnel will proceed to the next sample point and will repeat steps 4 through 9, using decontaminated sampling equipment.

11. Field documentation and chain-of-custody records for each sample will be completed according to Section 3.1, Volume II, Sampling and Analysis Plan.

12. The outside of the sample containers will decontaminated using the procedures in the Technical Memorandum, Decontamination Procedures, Appendix B, Volume II, Sampling and Analysis Plan.

13. The samples will be preserved according to Section 3.1, Volume II, Sampling and Analysis Plan.

14. The packaging and shipping protocol will be followed as described in Section 3.1, Volume II, Sampling and Analysis Plan.

TECHNICAL MEMORANDUM

PREPARED BY: Gregory M. Brown

DATE: September 23, 1991

TITLE: DECONTAMINATION PROCEDURES

PURPOSE: The purpose of this Technical Memorandum (TM) to provide technical guidance and standard operating procedures for decontamination procedures during field activities at Naval Station Mayport, Florida. This TM presents the decontamination procedures required for specific conditions expected to be encountered at Naval Station Mayport during RCRA Facility Investigation (RFI).

SCOPE: The scope of this TM covers decontamination procedures for the RFI at Naval Station Mayport. Standard operating procedures for related activities are presented in other applicable Technical Memoranda.

Decontamination of personnel and equipment will be performed to minimize the possibility of transport of contaminants off-site and between work areas, and to assure sample integrity. Sampling equipment coming in contact with soil, sediment, and water will be decontaminated prior to sampling, between sampling locations, between boring intervals, and at completion of the work. This will minimize the potential for cross contamination.

Decontamination of equipment will occur at the exclusion zone of the intrusive activities and at a main decontamination station. Small sampling and field equipment (e.g., trowels, bowls, sample containers, etc.) will be cleaned at the exclusion zone. A central decontamination station will be established for cleaning of augers, drilling bits, large tools, drill rigs, monitoring well supplies, and other large items.

Teflon™ and/or glass sampling equipment used for trace organics and/or metal sample collection will be decontaminated in accordance with U.S. Environmental Protection Agency (USEPA) Region IV ECB SOPQAM requirements using the following procedures:

1. Equipment will be washed thoroughly with laboratory detergent and water using a brush to remove any particulate matter or surface film.

2. The equipment will be rinsed thoroughly with tap water.

3. The equipment will be rinsed with at least a 10 percent nitric acid solution.

4. Equipment will be rinsed thoroughly with tap water.

5. Equipment will be rinsed thoroughly with deionized water.

6. Equipment will be rinsed twice with pesticide-grade isopropanol.

7. Equipment will be rinsed thoroughly with deionized water and allowed to air dry.

8. Equipment will be wrapped in one layer of aluminum foil. The edges of foil will be rolled into a "tab" to allow for easy removal. The foil wrapped equipment will be sealed in plastic and dated.

9. The Teflon® or glass sampling equipment will be rinsed thoroughly with tap water in the field as soon as possible after use.

When this sampling equipment is used to collect samples that contain oil, grease, or other hard to remove materials, it may be necessary to rinse the equipment several times with pesticide-grade acetone or hexane to remove the materials before proceeding with Step 1. In extreme cases, it may be necessary to steam clean the field equipment before proceeding with Step 1. If the field equipment cannot be cleaned using these procedures, it should not be used.

Small and awkward equipment such as vacuum bottle inserts and well bailers may be soaked in the nitric acid solution instead of being rinsed with it. Fresh nitric acid solution should be prepared for each cleaning session.

Stainless-steel or metal sampling equipment used for trace organics and/or metal sample collection will be decontaminated in accordance with USEPA Region IV ECB SOPQAM requirements using the following procedures:

1. Equipment will be washed thoroughly with laboratory detergent and water using a brush to remove any particulate matter or surface film.

2. Equipment will be rinsed thoroughly with tap water.

3. Equipment will be rinsed thoroughly with deionized water.

4. Equipment will be rinsed twice with pesticide-grade isopropanol.

5. Equipment will be rinsed thoroughly with deionized water and allowed to air dry.

6. Equipment will be wrapped in one layer of aluminum foil. The edges of foil will be rolled into a "tab" to allow for easy removal. The foil wrapped equipment will be sealed in plastic and date.

7. The stainless-steel or metal sampling equipment will be rinsed thoroughly with tap water in the field as soon as possible after use.

Well sounders and tapes used to measure groundwater levels will be decontaminated in accordance with the following procedures. They will be:

1. washed with laboratory detergent and tap water,

2. rinsed with tap water,

3. rinsed with deionized water,

5. allowed to air dry, and

4. wrapped in polyethylene bags or sheeting to prevent contamination during storage or transit.

The following procedures will be used to decontaminate the Goulds Pump used for well purging. Always disconnect the pump control box from the generator before cleaning.

1. Using a brush, the exterior of the contaminated hose and pump will be scrubbed with soapy water (e.g., using Alconox™).

2. The soap will be rinsed from the outside of pump and hosed with tap water.

3. The tap water residue will be rinsed from the outside of the pump and hosed with deionized water.

4. Equipment will be placed in a polyethylene bag or wrapped with polyethylene film to prevent contamination during storage or transit.

Large equipment (e.g., drill rig, augers) will be decontaminated using the procedures outlined below.

1. The equipment will be moved to the decontamination station after sampling and field activities are complete.

2. The equipment will be decontaminated using a high pressure steam cleaner with a soap cycle and water cycle. Scraping and scrubbing may be necessary to remove encrusted material. Items will be placed on sawhorses, pallets, or the equivalent to prevent contact with the ground.

3. The equipment will be rinsed with potable water.

4. The equipment will be placed on polyethylene sheeting, sawhorses, or clean pallets and allowed to dry.

Sampling and field equipment should not contact the ground surface prior to the next sampling location. Wrap appropriate equipment (i.e., monitoring well installation supplies) in polyethylene (plastic) sheeting. Decontamination fluids will be contained for subsequent treatment or disposal.

TECHNICAL MEMORANDUM

PREPARED BY: Gregory M. Brown

DATE: September 23, 1991

TITLE: GROUNDWATER SAMPLING

PURPOSE: To provide technical guidance and standard operating procedures for groundwater sampling at Naval Station, Mayport, Florida. It presents the groundwater sampling methods for shallow and deep single-cased monitoring wells completed in the surficial aquifer, and deep double-cased monitoring wells completed in the Secondary Aquifer (Upper Hawthorn Group), specific for conditions expected to be encountered at Naval Air Station Mayport during RCRA Facility Investigation (RFI).

SCOPE: Groundwater sampling methods for monitoring wells at Naval Station Mayport. Standard operating procedures for related activities such as drilling, subsurface soil sampling, and monitoring well construction are presented in other applicable Technical Memoranda.

Groundwater samples will be collected from each of the newly installed monitoring wells upon completion of well development. New wells will not be sampled for at least 48 hours after development. Wells will be sampled upon significant recharge, but no later than 2 hours after purging. Prior to each sampling event, groundwater levels and total depths of the wells will be measured on the same day. The procedures to be followed for collection of these data are as follows.

1. Approach the well from an upwind direction, obtain and record OVA/HNu readings at the well head (with cap off) and in the breathing zone.

2. Check the well for above-ground damage.

3. Equipment used during sampling will be decontaminated using the procedures outlined in the Technical Memorandum, DECONTAMINATION PROCEDURES, Appendix B, Volume II, Sampling and Analysis Plan.

4. Measure and record the depth from the top of the well casing to the top of static water level in the well casing. Calculate the height of water column (feet) and standing volume (gallons) of water in the well based upon known well details from installation records or measured total depth of well.

Cast acrylic, Teflon™, or stainless-steel bailers with nominal 0.25-inch diameter nylon (or equal material) cord or stainless-steel and Teflon™ bladder pumps will be used to sample groundwater. The purging and sampling procedures that will be used to collected groundwater samples from wells are summarized below.

1. Decontaminated bailers or pumps will be used to purge each well. Record time of initiating and stopping bailing and/or pumping activities on field sheet or in field book.

2. Purge the well by removing three well volumes of water or until the well is purged dry. Water purged from the wells will be collected and containerized. Wells purged to dryness will be allowed to recharge to static water levels or for approximately 2 hours prior to sampling for volatile constituents and 4 hours for sampling semivolatiles, pesticides/PCBs, and inorganics. Temperature, pH, and specific conductance readings will also be collected while purging the wells. The last set of readings will be recorded as the actual readings from each well.

3. Wells will be sampled using cast acrylic, Teflon™, or stainless-steel bailers, or stainless-steel and Teflon™ bladder pumps. If samples are collected from a well using a bladder pump, the pump flow rate will be turned down to a slow steady stream prior to filling the sample jars. This is especially important for filling volatile organic sample containers.

4. Fill the sample bottles in the following sequence:

   - volatile organic compounds;
   - semi-volatile and other organic analyses (as required); and
   - metals samples.

   Use the first bailer of water to fill the volatile organic analyses (VOA) vials. Fill the VOA vials such that a meniscus is formed on the rim of the vial and carefully cap the bottle. Tip the bottle upside down, tap on capped end, and inspect for air bubbles. Should noticeable air bubbles appear, repeat the process until an air-free sample is obtained. Use subsequent bailers to fill the remaining sample containers.

5. Place the samples in a secure shipping container after decontamination of the outside of the sample bottles. The outside of the sample bottles will be decontaminated using procedures in the Technical Memorandum, Decontamination Procedures, Appendix B, Volume II, Sampling and Analysis Plan.

6. The following information will be recorded on the field data sheet:

   - project name;
   - project number;
   - date;
   - well number;
   - personnel present;
   - sample number;
   - nature of any visible well damage;
   - OVA/HNu readings;
   - water level before purging (depth below top of casing);
   - time begin purge;
   - water level after purging (depth below top of casing);
   - approximate volume of water removed during purging;
   - sample time;
   - temperature;
   - conductivity;
   - pH;

- pH meter check before and after sample analysis;
- preservation, if applicable; and
- other data as required.

7. Replace well cap and lock protective casing.

8. Complete field documentation and chain-of-custody records for each sample according to Section 3.1, Volume II, Sampling and Analysis Plan.

9. Preserve the samples according to Section 3.1, Volume II, Sampling and Analysis Plan.

10. Follow the packaging and shipping protocol descried in Section 3.1, Volume II, Sampling and Analysis Plan.

APPENDIX E

SITE-SPECIFIC HEALTH AND SAFETY PLAN

SWMU 20, Hobby Shop Drain
SWMU 21, Hobby Shop Scrap Storage Area
SWMU 52, PWD Service Station Storage Area

ABB ENVIRONMENTAL SERVICES
SUMMARY SITE SAFETY PLAN

A. GENERAL INFORMATION

SITE: SWMU 20 (Hobby Shop Drain), SWMU 21 (Hobby Shop Scrap Storage Area), and SWMU 52 (Public Works Department [PWD] Service Station Storage Area)

SITE OWNER/CONTACT: David Driggers (SOUTHNAVFACENGCOM), Mike Davenport and Cheryl Mitchell (NAVSTA)

LOCATION: Mayport Naval Station, Mayport, Florida

PLAN PREPARED BY: Frank Lesesne DATE: Rev. 1/20/93

APPROVED BY: ______ DATE: ______

OBJECTIVE(S): To maintain health and safety during RCRA Facility investigation field activities that include installing monitoring wells and groundwater and soil sampling.

PROPOSED DATE(S) OF INVESTIGATION:

BACKGROUND REVIEW: Complete: X Preliminary: ____

OVERALL HAZARD: Serious: ____ Moderate: ____ Low: X Unknown: ____

B. SITE/WASTE CHARACTERISTICS

WASTE TYPES: Liquid X Solid X Sludge ____ Gas ____

CHARACTERISTICS: Corrosive X Ignitable ____ Radioactive ____

Volatile X Toxic X Reactive ____ Unknown ____

SITE DESCRIPTIONS: The following sections provide brief descriptions of SWMUs 20, 21, and 52.

SWMU 20, The Hobby Shop: The Hobby Shop is located in and around Building 414 in the southeastern part of Mayport. A.T. Kearney, Inc., conducted a Visual Site Inspection (VSI) for a Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA) in 1989. However, the conditions observed by A.T. Kearney, Inc., during the VSI are no longer present. Since 1991, renovations were made to parts of the Hobby Shop area.

According to the RFA report, in 1989 the Hobby Shop Drain (SWMU 20) was located at the southeast corner of Building 1277, which housed auto maintenance and repair bays (A.T. Kearney, 1989). The drain was located on the soil adjacent to a sloped concrete apron leading to the raised concrete floor of Building 1277.

The drain inlet was covered with a screen and led to an underground pipe. The outlet for the pipe was reported to be seen at grade in the western side of Building 1277 at the edge of an asphalt parking lot. The Hobby Shop has been in operation since 1959 (A.T. Kearney, 1989).

At the time of the VSI in 1989, the soil in the area of the drain inlet and along the edge of the concrete apron was stained and appeared oily (A.T. Kearney, 1989). Stains were also noted leading from the outlet of the drain pipe, across the parking lot, and toward a storm drainage ditch that parallels Massey Avenue on the south side of the roadway. A drainage pathway across the asphalt was clearly visible because of staining, and the asphalt was observed to be cracked with some repaired sections along its length. Oily stained sediments were noted in the drainage ditch and an oil sheen was noted at the point where the water in the drainage ditch entered a drain pipe that flowed under a side street perpendicular to Massey Avenue (A.T. Kearney, 1989).

The source of the dark staining and oil was not identified during the VSI (A.T. Kearney, 1989). Possible sources speculated in the RFA report included material drained from inside the automobile maintenance and repair bays, or runoff from the roadway and parking area to the east of Building 1277 (A.T. Kearney, 1989).

During a site visit by ABB-ES on May 5, 1994, the items described in the RFA Report (A.T. Kearney, 1989) were not observed. In 1991, the Hobby Shop area was renovated. This renovation included construction of a new Building 1277 (1277A) as well as a new drain system and concrete pavement across the entire site. Reportedly, during the construction work, soils were excavated and removed from the site. Documentation of the excavation and removal activities currently is not available.

The newly constructed drain system is comprised of long trough drains that run parallel to the bay door sides of each building to catch runoff from the working bays, and long trough drains in the open lots to catch the general parking lot runoff. The drains along the bays flow to an oil and water separator located beneath a grassy area west of the site. The oil is periodically removed for recycling and effluent from the oil and water separator flows into the sanitary sewer system. The trough drains in the open parking lot flow into small grassy swales at the south and east side of the site.

Near the south discharge point (parking lot drain) is a small waste oil storage area. This is a curbed area on the concrete pavement and contains five 75-gallon capacity containers on stands. A valved drainpipe extends through the curb towards the grassy area to the south, apparently to release rainwater buildup within the curb. Staining of the land surface adjacent to the waste oil storage area was not observed.

SWMU 21 Hobby Shop Scrap Storage Area: The RFA report describes the Hobby Shop Scrap Storage Area (SWMU 21) as a fenced area, approximately 20 feet square, located adjacent to the southern wall of the east wing of Building 414, approximately 20 feet from the southeastern corner of the wing (A.T.Kearney, 1989). The area was enclosed by the wall of Building 414, and by a chain link fence, except for an entrance way on the south side of the area. The surrounding parking area was underlain by pitted asphalt. There were no berms or curbs around the parking area.

Items stored in the Hobby Shop Scrap Storage Area included scrap metal, engine parts, and appliances. Scrap stored in the area was collected by the Defense Reutilization and Marketing Office (DRMO) for resale. Facility personnel were not able to provide the start-up date of the storage area but the Hobby Shop has been in operation since 1959 (A.T. Kearney, 1989).

At the time of the VSI in 1989, materials stored in the area included engine part, (including such items as engine blocks, rocker arms, and mufflers), two open gas cylinders, a 50 pound container labeled Freon 22, an automobile battery, a refrigerator, and other scrap metal items. Several of the engine parts were oily and had oil dripping onto the base of the storage area. The base of the storage area was heavily stained with dark oily materials (A.T.Kearney, 1989).

During a site visit on May 5, 1994, by ABB-ES, the items described in the RFA report were not observed. The Hobby Shop area was renovated in 1991. This renovation included construction of a new drain system and new concrete pavement across the entire site. Reportedly, during the construction work, soils were excavated and removed from the site. However, documentation of the excavation and removal activities was not available.

Currently, the scrap area is located towards the east away from the southeast corner of Building 414 near the eastern edge of the Hobby Shop site. The scrap is stored on concrete pavement. Oily parts similar to those described in the RFA report were not observed.

<u>SWMU 52, PWD Service Station Storage Area:</u> The PWD Service Station is housed in Building 25, which is located towards the east of the Destroyer Slip. The PWD Service Station Storage area is located on and adjacent to a concrete slab that is 30 feet long and 20 feet wide and is situated along the northeast wall of the building. There is a drain in the concrete slab that flows to a nearby oil and water separator.

At the time of the VSI in 1989, there were at least four 55-gallon drums stored on the concrete slab. Facility personnel indicated that one drum contained window washing solution, one contained coolant, and on contained waste oil. Another drum had an open bung and appeared to be one quarter full of an oily substance.

A waste oil bowser having a capacity of approximately 300 gallons was located on the asphalt just off the northeast edge of the concrete slab. Reportedly the bowser was emptied periodically and the oil was taken off-site to be recycled. Dark stains were noted under the waste oil bowser.

During a recent site visit by ABB-ES on May 5, 1994, the site generally appeared as described in the RFA report. However, there were no drums present on the pad and in place of the bowser was a small tank (approximately 250 gallons) within a metal containment tub. The tub has metal skids that keep it above the pavement. No significant staining of the pavement in the area of the tank was observed. A small pipe protrudes from the building wall above the concrete pad. This pipe discharges condensate from an air compressor in the building. Any condensate would ultimately flow into the drain and be processed through the oil and water separator. The oil in the separator is periodically collected for recycling and effluent from the oil and water separator flows into the sanitary sewer system.

PRINCIPAL DISPOSAL METHODS (type and location)

SWMU 20, Hobby Shop Drain. Waste oil and potentially solvents were used to clean automobile parts. Releases were potentially made to asphalt surfaces and soils topographically downgradient from a former drain adjacent to former building 1277. Stained soils and sediments also occurred within the drainage pathway leading from the drain. The site was renovated in 1991 and none of the features or conditions observed during the VSI are currently present.

SWMU 21, Hobby Shop Scrap Storage Area. Automobile parts were stored on a pitted asphalt surface. The parts were observed during the VSI to be coated by oil and/or dripping oil to the surface of the storage area. The storage area was renovated and moved during 1991 and none of the features and conditions observed during the VSI are currently present.

SWMU 52, PWD Service Station Storage Area. During the VSI, a waste bowser was located on the asphalt off the northern edge of the concrete slab and drums of window washing solution, automotive coolant, and waste oil were present. None of the features and conditions observed during the VSI are currently present.

STATUS (active, inactive, or unknown)

SWMU 20 - Active
SWMU 21 - Active
SWMU 52 - Active

HISTORY (Worker or nonworker injury, complaints from public, or previous agency action)

SWMU 20: no previous assessment activities have been conducted.
SWMU 21: no previous assessment activities have been conducted.
SWMU 52: no previous assessment activities have been conducted.

C. HAZARD EVALUATION

Chemicals that personnel may be exposed to are solvents and wastes containing volatile organic compounds, fuel hydrocarbons, and inorganic chemicals such as chromium, mercury, and lead contained in sludge and other wastes. A chemical hazard information sheet for each compound suspected of being present onsite is contained in Appendix A, Volume III, RFI workplan.

This site is suspected of supporting a large population of Eastern Diamondback Rattlesnakes. Fire ants are also prevalent.

D. SITE SAFETY PROCEDURES

Map/Sketch Attached? Yes   Site Secured? Yes

Perimeter Identified? Yes   Zone(s) of Contamination Identified? Yes

PERIMETER ESTABLISHMENT. Access to Mayport NAVSTA is restricted at all points.

PERSONNEL PROTECTION

TASK	MINIMUM LEVEL OF PROTECTION
All Activities	Level D

MODIFICATIONS. Level C protection will be used as a contingency should photoionization meter or organic vapor analyzer (OVA) readings exceed 5.0 parts per million (ppm) in ambient air in the breathing zone and if identification of the compounds present can not be made. If compounds can be identified the appropriate action level will be determined based on the appropriate permissiblel exposure limit (PEL) or threshold limit value (TLV).

Should it become apparent during any phase of the field activities that conditions are different from those anticipated, the Health and Safety Officer (HSO) will immediately withdraw all personnel from the site until health and safety conditions at the site are reevaluated.

SITE MONITORING INSTRUMENTATION. A photoionization meter or equivalent will be on hand at all times to monitor total volatile organics in ambient air surrounding exploration activities.

DECONTAMINATION PROCEDURES

Personnel: Will be conducted as outlined in Volume III, RFI workplan

Equipment: Will be conducted as outlined in Volume III, RFI workplan between each boring and upon entry to NAVSTA and upon completion of the drilling program prior to the subcontractor leaving the NAVSTA.

MOBILIZATION AND SITE ENTRY. A contamination reduction area will be established onsite. Field work preparation, staging, and decontamination will take place in this area.

TEAM ORGANIZATION:

Team Member	Responsibility
L. Smith	Field Operation Leader (FOL)/Site-Safety Officer (May Delegate Site-Safety Officer)
M. Jaynes	Sampler/Site-Safety Officer as designated by (FOL)
D. Mustonen	Sampler
P. Crain	Sampler
P. Layne	Project Manager
F. Lesesne	RFI Task Leader
Others	As required

WORK LIMITATIONS (Time of day, etc.). During daylight hours only and as restricted by Mayport NAVSTA operations and security.

PERSONNEL PROTECTIVE GEAR, DECONTAMINATION, AND OTHER MATERIAL DISPOSAL. Personnel will use Level D protection. See Table G-1, p. G-55 (Volume III of the RFI workplan) for a list of personnel protective gear. Decontamination fluids will be containerized and turned over to base personnel to incorporate with their hazardous waste.

APPENDIX F

Responses to Florida Department of Environmental Protection and National Oceanic and Atmospheric Administration Technical Review Comments

Response. The monitoring wells were located where surface water may have conveyed contaminants to drainage areas off the edge of pavement at SWMUs 20 and 21. The purpose of confirmatory sampling is to assess whether there has been a release of hazardous constituents to the environment, not conduct assessment of horizontal and vertical extent of contamination. The locations proposed for the wells should provide data sufficient to determine groundwater flow direction and to select monitoring well locations for future assessment activities if contaminants are detected in the groundwater samples.

4. **Comment. Information regarding the Waste Oil Storage Area is incomplete. Is this a new facility? Has spillage been reported in the past or is there current evidence of potential contamination? Is proposed Monitoring Well MPT-20-MW2 located at the most advantageous position (Comment 2).**

NOTE: The presence of concrete is not a satisfactory reason for eliminating the installation of monitor wells.

Response. During the September 1, 1994, site visit by the NAVSTA Mayport Partnering Team, stained soil was observed on the southwest side of the waste oil storage area. Monitoring well MPT-20-MW2 will be moved closer to this area.

<u>SWMU 21 Hobby Shop Scrap Area</u>

1. **Comment. To evaluate potential contamination, Monitoring Well MPT-21-MW1 and associated soil sampling should be positioned as close as possible to the original storage area site.**

NOTE: See comment above.

Response. As discussed on September 1, 1994, at the NAVSTA Mayport Partnering Meeting, a monitoring well will be installed at the location of the SWMU 21 drain outlet.

<u>SWMU 52</u>

1. **Comment. A site visit and groundwater flow determination is recommended to ensure that the monitoring well is placed at the most advantageous position.**

Response. The purpose of confirmatory sampling is to assess whether there has been a release of hazardous constituents to the environment, not conduct assessment of horizontal and vertical extent of contamination. As indicated on Figure 3-2 in the Group III RFA Workplan, a monitoring well will be installed at the location where the oil bowser was reported in the Resource Conservation Recovery Act Facility Assessment report (A.T. Kearney, 1989) to formerly have been located.

<u>Chapter Four</u>

1. **Comment. Tables are provided in this section listing Appendix IX Analytes for groundwater. A statement should be provided regarding Appendix IX soil parameters.**

Response to Comments
National Oceanic and Atmospheric Administration
August 4, 1994
Group III Resource Conservation and Recovery Act (RCRA)
Facility Assessment Sampling Visit Workplan

Section 1.2, page 1-7

Comment. The calculation of risk takes into account a number of factors including: contaminant levels, toxicity of contamination, exposure routes, and potential receptors. Preliminary risk screenings are mentioned in this section in reference to human health risks. All Solid Waste Management Units (SWMUs) should be evaluated in terms of environmental risk in accordance with RCRA guidelines requiring an environmental risk assessment for all investigations. If preliminary screenings are conducted, they should also be conducted with respect to environmental risk. This evaluation includes, but is not limited to, comparisons of analytical data with relevant screening guidelines (i.e. EPA Region IV sediment screening levels, ambient water quality criteria, etc.), an analysis of frequency of detections, exposure pathway analysis, and a description of potential environmental receptor species and habitats; trust species should be an integral component of the receptor species evaluation. Recommendations on whether additional sampling should be carried out, or whether an RFI should be conducted, must take into account site-related environmental risk.

Response. Comment noted.

Section 5.0, pages 5-1 - 5-7

Comment. This section elaborates on what is found in Section 1.2, page 1-7. The comments for that section apply here also.

Response. Comment noted.